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[Founded in 1849 as the "Journal of Gas Lighting."]

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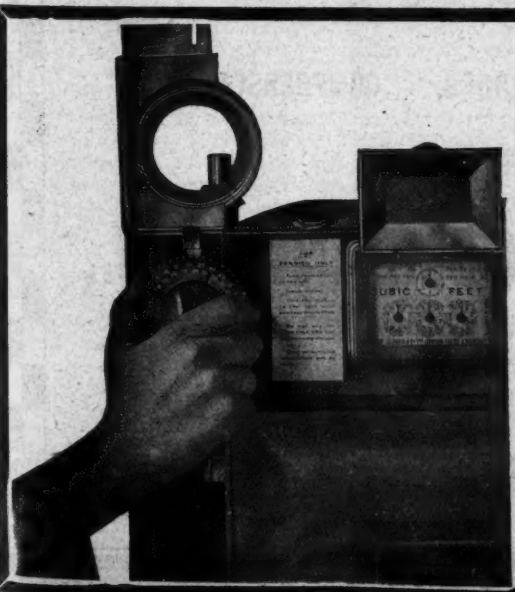

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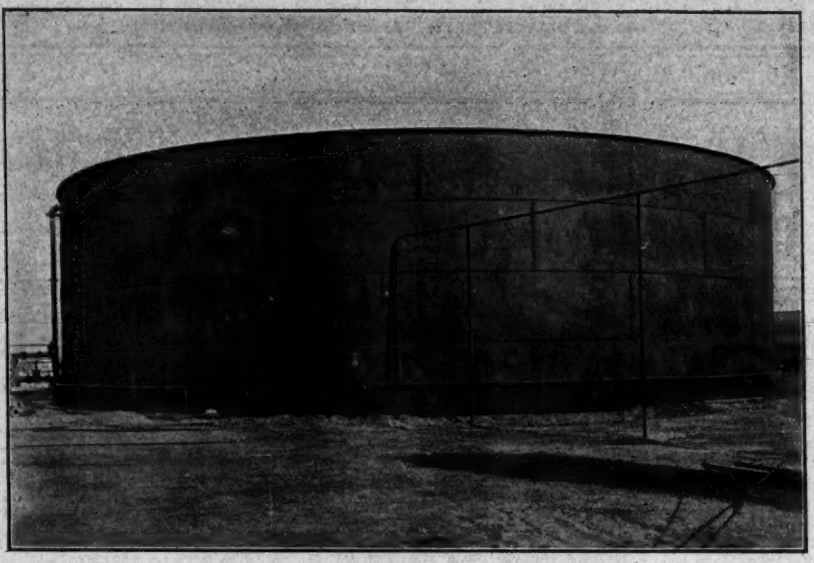

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EDITORIAL NOTES.

The Rule of Therm Returns.

WHAT is to be the general practice in stating in annual or half-yearly (as the case may be) accounts the make, sale, unaccounted-for gas, &c., in therms? The South Metropolitan Gas Company is the first to have a complete year's accounts under the therm system; and the Gas Light and Coke Company have been operating for nine months under the system. But the gas manufacturing and sales statements of the two Companies in the annual accounts now before us vary considerably. For technical information and comparison, and in fairness to the engineers responsible for the manufacturing operations, the fullest of necessary particulars is desirable; and it would be much more convenient if in all gas undertakings' accounts, there could be an agreed, consistent form of statement.

Of the two Companies, the Gas Light and Coke give the most complete particulars for technical computation; but even in their case, there is a little information missing, which could have been given in a footnote. The figures in the statement of gas made, sold, &c, are entered in cubic feet and in therms at the "actual" calorific value supplied —482 B.Th.U., and an additional figure is given under "total quantity sold" showing the therms at the "declared" value of 475 B.Th.U. The figures are for the two years 1921 and 1920, so that comparison can be readily made. This is a complete statement with one exception; but the omission makes investigation into manufacture a little difficult, unless one is satisfied with calculating-out on more or less hypothetical figures which would only supply an approximate result. The total quantity of gas made is stated in cubic feet and in therms at the actual B.Th.U. per cubic foot sent out (482 B.Th.U.). But this is mixed gas. Of the 33,443,596,000 c.ft., 11,043,712,000 c.ft. were water gas, and water gas enriched with 1·27 gallons of oil per 1000 c.ft., and 22,399,884,000 c.ft. were coal gas. It would have been useful—this is the omission—if a footnote had been appended, giving the average B.Th.U. per cubic foot of coal gas and per cubic foot of carburetted water gas. We have reproduced the Gas Light Company's statement in full in later columns to show exactly how it is presented.

In the case of the South Metropolitan Company, only the therm figures for the year are published. Deducting the quantity of therms received from the Fuel Research Board's station, it is seen that 83,748,687 therms were made by the Company; and dividing this figure by the quantity of coal carbonized—1,197,975 tons—we get 69·98 therms per ton as the make. It would therefore appear from this (we hope there will be correction if we are wrong) that the Company are making their returns on the "declared" value only. There is something to be said for both plans—for making the statement on the declared value, and for making it on the actual value. During the reigns of statutory illuminating power and calorific value standards, there had always to be a margin beyond the standard for safety; and no account was taken of this, except in official reports. The same thing applies now—a margin of safety has to be supplied; and in the case of the Gas Light Company it is 7 B.Th.U. per cubic foot. But that margin of safety is of no financial value, other than that the charge made for gas includes its provision. The South Metropolitan Company's accounts do not show us what it is in their case; but the report of the Gas Referees for last quarter shows that the average calorific power of the gas was 554·6 B.Th.U. Therefore, the margin between the "declared" and the "actual" was for that period 4·6 B.Th.U. Now that gas is being sold on quality, it appears to us that it is only right that in some manner credit should be taken in the accounts for the excess; this is only fair to the officials responsible for manufacture. They ought to have just as much credit for the actual thermal value produced from the coal, as the Carpenter burner ensured they should get when the illuminating power standard was the controlling factor. Besides, there is technical value in knowing fully the thermal practice in this respect of each undertaking.

There are one or two other interesting points. One is that the Gas Light and Coke Company supply 207 c.ft. to the therm; while the South Metropolitan Company supply a therm, taking the declared value, at 25·2 c.ft. less, or 181·8 c.ft. Another interesting point is that, in the case of the Gas Light Company, the total therms sold calculated at the actual value supplied was 146,348,303; while at the declared value the number of therms sold was 144,317,027. Of course, a gas undertaking only gets paid for the therms at the declared value; so that the actual therms supplied would be misleading without an accompanying and qualifying figure at the declared rate. The difference between the therms mentioned at the actual value and the declared value per cubic foot is 2,031,276, which, multiplied by 207 c.ft. per therm, equals the large volume of 420,474,132 c.ft. But the main point it is desired to emphasize is that there is technical value in publishing the fullest thermal information in the accounts. We hope this will generally be done, and in a uniform manner, so that comparison may be on a consistent basis. Only in this way will it be possible to make exact comparisons.

A Great American Gas Engineer.

NEWS reaches us of the sudden death of Mr. William H. Bradley, the Chief Engineer of the Consolidated Gas Company of New York, and the *doyen* of the American gas profession. To his family and to the American gas profession we offer our respectful and sincere sympathy; for Mr. Bradley was a man who was not only a great gas engineering leader and a lover of his work, but he was a man for whom the more one knew him, the greater became one's admiration and affection. We knew him not only by reputation and by the character of his engineering work and achievements, but personally through the visits he paid to the "JOURNAL" office on his last European trip. Solid in external appearance, we found him a man in all respects of solid worth, and solid in gas-engineering ability and management. He had vision, was progressive, and his initiative was of a high order. The great gas plant at Astoria (Long Island) is a monument to his engineering conception, skill, and execution; for those works are his from the choice of site onwards. We remember his happy and hearty laugh when in this office, and talking of the capacity of the East Greenwich holder. He said he would exceed that capacity at Astoria. He kept his word, and erected a 15 million cubic feet holder there; and only ten days before his death, he turned the first gas into a second holder of like capacity. He was doing this at 84 years of age; and his end came, through heart failure, while in his own office in the Consolidated Gas Company's Building in New York. Thus he ceased his activities in the midst of the work he loved, and of which his energy and interest would not permit him to lose touch. In it all there was for him attraction and happiness. He was a wonderful man—a man with a large comprehension and outlook. This is embodied in and emphasized by his achievements. The whole gas-engineering world has lost another of its most brilliant leaders.

A Complex Gas Trading Year.

THE year 1921 will be remembered in the gas industry for the complex conditions, mostly of an adverse nature, that assailed its trading operations. There was the coal strike prolonged to three months, which was a costly happening, and upset all estimates. There was the great slump in secondary products which swamped the lower cost of coal, and left its net cost very much out of harmony with the preceding year, though one must qualify this by stating that 1920 was a remarkable one in respect of the values of, and revenue from, secondary products—chiefly coke. Following the decline of the price of coal and the restrictions on the export of coke during the strike, with the reduced demand from abroad at other times, there was the heavy drop in the price of coke. The abundance of the supply of nitrogen in the world brought down with a run the market values of sulphate of ammonia. There was the depression in industry and trade, and the big wave of unemployment, which together caused a restriction in the demand for gas. And there was that wonderful summer, which was also something on the adverse side so far as the gas business goes. It was a year which defies any comparison, because there was not another of like complexion or of such varied and deep-set characteristics. But with it all—with all the flights that figures made from those that obtained in 1920, and which flights are expressed in a remarkably forcible manner in the accounts of the Gas Light and Coke Company—the proprietors of that gigantic concern will next Friday meet the Governor (Mr. D. Milne Watson) and his colleagues on very good terms. In passing, a few words as to those colleagues. Since the proprietors last met, Mr. John Miles and the Deputy-Governor (Mr. H. J. Waterlow) have gone over to the majority. Mr. J. Lister Godlee has become the Deputy-Governor. The Hon. Clive Bigham has become a Director; and Mr. Thomas Goulden has vacated the executive office of Chief Engineer for an administrative office, by being elevated to the Board. The seat of Chief Engineer will now be found occupied by Mr. Thomas Hardie.

As remarked, the proprietors will meet the Governor and his colleagues on very good terms; for a dividend is to be declared for the half year at the rate of £4 13s. 4d. per cent. per annum, which, with the 4 p.ct. interim dividend, will average out to £4 6s. 8d., which is a welcome jump from the miserable 3 p.ct. which was all that could be paid in 1920 under the Statutory Undertakings (Temporary Increase of Charges) Act. The available balance of £661,411 (which is £90,329 more than a year ago) will allow of this being done. Moreover, the consumers are benefiting too; for the price of gas is now 1s. 1d. per therm, or 2·2d. per therm below the standard. A sum of £10,000 has been placed to the redemption fund, which was not the case twelve months ago. After this transfer and payment of the dividends, £144,357 will remain to be carried forward—true £182,241 less than a year ago; but still in the circumstances the result is good—particularly when it is noted that the cost of the coal strike to the Company did not fall very far short of half-a-million sterling.

The accounts are reproduced in large part elsewhere in this issue. Here we will just glance at some of the salient features. The quantity of coal carbonized in the year was 1,836,935 tons, or 442,318 tons less than in 1920. The expenditure on coal was £4,190,853, or £1,128,011 less than for the larger quantity in 1920. The reduction was therefore mainly due to the smaller amount of coal carbonized. The market conditions for secondary products were alone a sufficient warrant to allocate a larger proportion of manufacture to the water-gas plant. The quantity of oil used was 14,132,779 gallons, as compared with 6,251,005 gallons in 1920; so the oil consumption was more than doubled. This was not attributable only to the increased quantity of water gas made, but also to the additional amount used per 1000 c.ft. The coal gas made amounted to 22,399,884,000 c.ft., and the water gas to 11,043,712,000 c.ft.—together 33,443,596,000 c.ft. The make of water gas was more by 3,692,919,000 c.ft. than in 1920. Of the total make of gas, the water gas was equal to 33 p.ct., as compared with 20·9 p.ct. in 1920, when secondary products were flourishing exceedingly. These figures are presented in cubic feet, and not in therms, as no information is given regarding the actual calorific values respectively of the coal gas and water gas, though, of course, they could be calculated approximately. But we will not trouble. The actual calorific power of the mixed gas was 482 B.Th.U.; the declared being 475 B.Th.U., so that the Company worked to a margin of 7 B.Th.U. per cubic foot. The make of coal gas was 12,194 c.ft. per ton, which is the same as in 1920 within a couple of cubic feet. The quantity of oil used for carburetting the water gas was 1·27 gallons per 1000 c.ft., which compares with 0·85 gallon in 1920. This is good practice with the price of oil lower, and the advantages that the distribution system and consumers' meters gain from the passage through them of mixed gas containing a reasonably oil-enriched water gas. On the quantity of oil used last year £514,518 was spent, or £298,694 more than the smaller quantity in 1920. On the coke used in the manufacture of the water gas, there was an expenditure of £476,492, or £141,326 more. The total gross cost of raw materials for manufacture was last year £5,181,863, or £687,991 less than in 1920; but it should be borne in mind that, besides lower prices, there was a reduction of 5 p.ct. in the gas sold. As to the net cost of the raw materials, secondary products only produced about one-half what they did in the previous year—£2,497,837, contrasted with £4,839,214; being a reduction of £2,341,377. The result of this is that the net cost of the total raw materials last year was £2,684,026, compared with £1,030,640 in 1920, or £1,643,386 more. What have the agitators for a more rapid reduction in gas prices to say to this? Examining the receipts for secondary products, coke realized £1,945,506, or less by £1,717,104. Breeze was the only secondary product that showed an improvement. The income from it was £199,908, or an increase of £41,608. Tar and tar products, like coke, had a heavy fall. In bringing in £222,432, they shed no less than £467,898 from the receipts in 1920. Then, again, ammoniacal liquor and sulphate contributed only £129,990, which was less by £197,984. So we get to the enormous reduction of £2,341,377 from the admittedly extraordinary figures of 1920 for secondary products.

Coming to the gas business, there was, as previously stated, a reduction of consumption equal to 5 p.ct.—this for reasons already explained, and generally applicable to most gas undertakings. The causes for it were all outside the Company itself. Demand depends very much on atmospherical conditions, and the state of industry and employment. The area of the business extends. The addition to the number of consumers last year was 4981; the increase in the number of stoves sold and let on hire was 39,065. The letting-out on hire of gas-fires was resumed in October last; and the demand that immediately followed showed that the public thoroughly appreciated the return to the old practice. That is satisfactory. Another consideration applying to the future is the projected incorporation of the Ilford Gas Company's undertaking in that of the Gas Light Company. This will give extra breathing space. It is seen, too, that goodly sums are being spent from capital account on the extension of works, additional mains, service-pipes, meters, and stoves. This is not replacement work; and so it tells a tale as to anticipated prospective requirement. Coming to the actual gas business, it will be remembered that the secondary products *débâcle* at the beginning of the year necessitated the raising of the price of gas; but since costs have been sinking to a more reasonable state, reductions of price have started under the therm basis of charging. The price is now 1s. 1d. per therm, which is 2·2d. below the standard per therm. The Directors had also to consider the claims of capital to a fair return under the Order issued in conformity with the Gas Regulation Act; and no one can say that the dividend that is being declared is either unjustified or, for the matter of that, what it ought to be for a commercial enterprise. But it cannot go higher without the consumers also sharing in any improvements in prosperity. The total revenue from gas during the year was £8,045,068, which represents an increase of £778,717. The rental of meters and stoves shows a combined increase of £5453—meter-rental amounting to £166,176, and stove-rental to £192,915. But the rental from fittings was less by £12,800; the income being £300,375.

It has already been mentioned that the calorific value of the gas actually supplied was 482 B.Th.U., while the declared value is 475 B.Th.U. The statement of gas made and sold is presented on both the cubic feet and therm basis for 1920 and 1921. For this facility of comparison, the proprietors will be very grateful. The therm figures are given on the basis of the B.Th.U. per cubic foot actually supplied; and under the item "total quantity sold" is included the equivalent worked out on the "declared" basis. As previously said, the make of gas was 33,443,596,000 c.ft.,

or a reduction of 1,705,113,000 c.ft. When these figures are translated into therms, we have 161,091,843 therms as the make, or a reduction of 9,520,446 therms. This shows how, particularly in the case of a large undertaking, the therm basis presents figures which are more easily handled than cubic feet; seeing that, in the case of this Company, a therm (taking the B.Th.U. actually supplied per cubic foot) has to be multiplied by 206 to get at the equivalent cubic feet. The private consumption amounted to 142,071,280 therms, or a reduction of 8,408,952 therms. The total quantity sold was 146,348,303 therms, or less than in 1920 by 8,819,047 therms.

Glancing generally over the revenue account, manufacturing expenses declined by about 1½ millions, and distribution is down by a good round sum. The total expenditure was £10,134,881; and the total revenue, £11,232,359—the balance to net revenue account being £1,097,478. For 1920, the gross balance was £913,535. In view of all the extraordinary circumstances of the year, the accounts will, we feel sure, be endorsed as good when the proprietors meet on Friday this week.

The Exceptional Year and South London Results.

THERE will necessarily be a great deal of similarity between the tales that will be told this month in reports and accounts and at meetings of gas companies as to the operations of the past year. The causes of reactionary movements must be alike, and so therefore will be the effects, though geographical and domestic differences may make some distinction in the measure of the latter. So it comes about that when, immediately after examining the Gas Light and Coke Company's report and accounts, we come to those of the South Metropolitan Gas Company, much the same story is found, with in most respects only the differences that issue from respective magnitude. The coal strike, the markets for secondary products, the length and heat of the summer, and trade depression are all prominent as causes, and in their effects upon the trading of the year. In the first place, it is observed that the President of the South Metropolitan Company (Dr. Carpenter) and his colleagues have adopted the policy of not wiping-off in one year all the additional expenditure of £350,000 for coal that was imposed by the stoppage of the mining industry. In this they are wise. It is, of course, always nice to get rid quickly of a burden of this kind. But this one was not due to bad management, nor to any ordinary backward movement of the markets for secondary products, nor to other more or less usual circumstances. And looking forward, there is sufficient and good ground for the hope that the coal strike will, anomalous as it may seem, have the effect of steadying the market for coal upon the basis of lower terms, and that, with the outlook for lower prices for plant, material, and labour, expenses of production and operations generally will descend to lower levels; and thus the future will be able to share in liquidating the extra cost of coal that the stoppage occasioned in the year 1921. Of course, the consumers will have to pay sooner or later; but we have no doubt they would, given the opportunity, quite agree with the policy of the Directors in drawing from them immediately only £150,000 towards defraying the additional cost, and deferring the liquidation of the balance. That is what the Directors decided to do, and so the price of gas was raised by 1d. per therm, making it 11½d., which is the lowest price in and about London, with the exception of that of the Hornsey Company, who are now charging 11d. per therm. The Board naturally regret this raising of the price; and they speak of it in their report as a "high price." It is not a high price relatively to costs; but it is when comparison is made with pre-war days.

Among other things, the position means that the Directors are unable to pay the proprietors more than the basic dividend of 5 p.ct. They, however, have something for which to be thankful in that they have a basic price per therm and a minimum dividend of 5 p.ct. Had they been on the old sliding-scale, there would, assuming the basic price had been the standard price and the basic dividend the standard dividend, have been no help for it but a payment of something below the 5 p.ct. for the past half year. As it is, with all the difficulties and set-backs of the year, the Company have on the net revenue account a sum available for dividend (£172,079) which we believe is sufficient to pay the basic dividend for the past half year. The consumers, the proprietors, and the co-partners of the Company have all good reason for regarding with anything but kindly feelings the mistaken policy of the blind leaders of the coal miners which brought so much disaster to the country and to the miners themselves.

A good sign in the report is that the President and his co-Directors are looking forward hopefully to the future. There is sound reason for this in the conditions as to costs, the lowering of which will cheapen production. The markets for secondary products, viewed as a whole, cannot be worse; and with a stimulation of general trade, they may improve. Whatever may be our political view, recent legislation it may be expected will better the position of the chemical industries, and so the value of tar and tar products. The outlook for gas is excellent. The Company have added to their registers some 2386 new consumers and 10,278 additional stoves, as well as a large number of other appliances which have been sold or let on hire during the year. In the revenue account, too, it is seen that the rental of meters, stoves, and fittings has increased, by £20,817, to £350,117—contributions to the increase being made by each item. Meter rental, being £118,002, brought in £1367 additional; stoves and fires, yielding £92,822, brought in £5236 more; and gas-fittings, contributing £139,292, gave £14,214 extra. These are all influences which will help, with improving trade, to turn the 1·8 p.ct. decrease in gas sales of the past year into an increase again—such, for instance, as was being experienced in 1920, when the sales advanced by 5·4 p.ct. Without considerable calculation, we could not on this occasion give comparative total figures as to the gas sales; seeing that for 1920 the gas statement was made in respect of nine months in cubic feet and for the remainder of the year in therms. Perhaps at the meeting to-day, the President will give more definite information. But the total sale of therms was 78,551,114, of which private consumption required 77,030,458, and public lights 1,520,656. The total revenue from gas was £3,430,373, which was greater than in 1920 by £418,447—due to the increase of price. Private consumption yielded £3,367,078; and public lighting £63,294. Of the total receipts for private consumption, the Midsummer half year at 10½d. per therm contributed £1,667,375, and the December half at 11½d. per therm £1,699,703, which shows that the greater consumption took place in the June half year.

For the reason already stated, we cannot, without indulging in some amount of calculation, make on one basis comparison of the manufacturing results. It has been noted that there was a reduction of 1·8 p.ct. in the sale of gas; and to this is attributable the fall, by 13,882 tons, to 1,197,975 tons of the quantity of coal carbonized. The therms made numbered 83,828,000; but from this figure has to be deducted 79,318 therms purchased from the Fuel Research Board's station. This gives as the Company's own production 83,748,687 therms, which is equivalent to 69·98 therms per ton of coal carbonized. For the lower quantity of coal carbonized, some £209,218 more was paid than in 1920—the expenditure for 1921 being £2,554,188, and for 1920 £2,344,970. The secondary products produced £1,483,249, which was a drop of £660,091 compared with 1920. This illustrates how the bye-products markets went to pieces. Deducting the bye-products income from the expenditure on coal, the net cost was £1,070,939, compared with £201,630 in the remarkable secondary products year 1920—a difference in net cost between the two years of £869,309. Examining the secondary products items, coke yielded £1,128,043, or £282,052 less than in 1920, though the quantity sold was 651,273 tons, compared with 563,923 tons in 1920. Breeze was the only item that increased. It produced £29,846, or £1182 more. Tar and tar products yielded £232,513, or £272,398 less. Ammonia and products supplied revenue to the amount of only £92,847, or £106,821 less than in 1920. In the balance-sheet tar, ammonia, and products in store are valued at £192,357.

There are no extraordinary variations in expenditure compared with 1920. But a footnote to the revenue account indicates the extent of the decline in the wages charge. The figure last year was £1,735,842; in 1920, £1,848,148. The total expenditure was £4,827,446, or a reduction on 1920 of £173,088. The total receipts were £5,268,068, which was less by £220,013 than the income for 1920. The balance of £440,622 carried to net revenue account is less by £46,925 than in 1920. Looking at the price per therm, and the 5 p.ct. dividend, and considering the remarkable repressions to working and trading during the year, the proprietors and the consumers both have something to be thankful for that the tale of the accounts is so favourable.

The Eight-Hour Day—Labour and Industrial Efficiency.

LABOUR is getting agitated over the eight-hour working day. There is nothing sacrosanct about a working day of that duration. It applies very well to the major part of the gas industry, because operations are continuous, and 24 is a multiple of three. So eight hours, for the character of the labour that has to be performed, is very convenient. But the General Labour Council are of opinion that employers in almost every industry are making efforts to get the normal working day extended: and so the Council are advising joint action by labour in defence of the eight-hour day and trade-union conditions generally. The question is, why are employers in other industries trying to get the eight-hour day extended? They are not doing it with any great unanimity. The proposal has only been made where the employers believe that an industry, and therefore its employees, would benefit through production. But the trade unions firmly say "No." Trade union principles must take primary, national welfare a secondary, place. The former must be inviolate; the latter must get on as best it can under the inflexible conditions laid down by trade unionism. Whether additional working time would enable production to be increased and thus cheapened, and so assist in the development of demand and therefore employment, is something that is of very little concern to the trade unions. Yet ordinary, reasonable beings would have thought that, prosperity and employment going together, anything that promoted the latter would have been something that trade unions would have welcomed, and would have done their best to advance.

One representative trade union official holds that the adding of an hour would not result in any commensurate increase of production, because the extension would be at the most unprofitable part of the day. By this we suppose he means when men are not so physically fit as they are earlier in the day, and so the value of their work tails-off. Yet according to the precious trade union principles, this is the part of the day when time-and-a-half is considered to be correct pay for the work then done—which work it is confessed is of less value! The defenders of trade union liberties and principles are shockingly illogical. They have no ground more firm than assumption for asserting that an extension of the working day by a modest amount would not assist production, trade, and employment, and therefore the country. It may be quite true that the nations represented at the Washington Conference are by Article 2 of the Convention committed to an eight-hour day. But this does not alter the fact that, in the existing conditions of the country, its industry, and its trade, an extension of the working hours in certain industries might be of considerable benefit. We have seen by serious consequences what a reduction of the working day from eight to seven hours has meant in the coal-mining industry. Production has substantially diminished; and this has resulted in an addition to costs which every industry and purchaser in the country has felt. Perhaps the Trade Union Council will urge the levelling-up of the miners' hours to eight. It is not in the hours of its own men that the gas industry is concerned. It is in the hours of those industries (such as the coal, steel, and iron industries) upon which it depends for supplies, and—this generally in industry—for a not inconsiderable part of its business in gas and secondary products. If a moderate extension of hours in other industries would reduce their costs and improve prosperity, the gas industry would share in the accruing benefit. It is a pity the trade unions do not look at these matters openly instead of from the single and narrow point of view of a defence of trade-union principles. Principles of this kind should be made to relax if necessary, and so conform, with change in economic conditions. Principles are only good so long as, in a definite set of circumstances, they serve the best ends. Change the circumstances, and the principles may require to be modified. Further, as work varies so considerably, the character of the work, and its physical or mental demands, should come in as factors in determining hours.

Looking in another direction, the National Joint Council is an important and influential body. It is representative of the General Council of the Trade Union Congress, the National Executive of the Labour Party, and the Parliamentary Labour Party. The Joint Council has decided to appoint a Committee of Inquiry; and the first reference to that Committee is commendable. Consideration is to be given to the causes that are impeding maximum production in industries and services, from the standpoint of the interests of the community; and the Committee are to advise as to what improvements in organization and direction can be suggested. The Joint Council also want them to advise as to a labour policy for those industries to which nationalization cannot at present be applied—such policy to have regard to the efficiency of the industries, to the status and welfare of the producers, and to the best interests of the consumers. We are not altogether enamoured of the second reference, nor will be the administrators of the industries concerned. Those who direct those industries are fully persuaded that they are the best judges of how to manage them without more interference on the part of organized labour.

Gas Referees' Gas-Testing Reports.

A specimen report of the Gas Referees, relating in this case to the South Metropolitan Gas Company, appears in our news columns to-day.

The B.Th.U. Margin.

An interesting point in the supply of gas on the therm basis is the margin of B.Th.U. per cubic foot at which gas undertakings will find it possible to distribute so as to have sufficient calorific safety. The Gas Light and Coke Company last year supplied 482 B.Th.U. per cubic foot, while the declared value was 475 B.Th.U., so that the margin was 7 B.Th.U. In the case of the South Metropolitan Gas Company, the declared calorific value is 550 B.Th.U. The Gas Referees report that during last quarter the average calorific power was 554·6 B.Th.U., which shows that the Company during that period worked to an average margin of 4·6 B.Th.U.

Synchronous Meetings.

There are doubtless investors who hold stock in the Gas Light and Coke Company, the South Metropolitan Gas Company, the Brentford Gas Company, and the Tottenham Light, Heat, and Power Company, and who would like to be present at the annual meetings of all four Companies. If such a proprietor attends the South Metropolitan Gas Company's meeting to-day, he cannot attend that of the Brentford Gas Company, as the one is fixed for two o'clock, the other for two-thirty. If he attends on Friday the Gas Light and Coke Company's meeting at noon, he will have subsequently to have a hasty lunch in order to get to Tottenham in time for the three o'clock meeting there. It is a pity something cannot be done by the Companies in and about London to avoid this clashing of meetings.

Do Consumers Like the Therm System?

We have heard various people say that consumers of gas do not understand or appreciate the therm system of charging. It has been our contention that they must prefer to buy quality rather than volume of doubtful quality. And as to the consumers understanding the system, they no doubt understand it equally as well as the cubic foot method of charging. The South Metropolitan Gas Company have had sixteen months' experience of the therm system—the longest of any gas undertaking in the country; and this is what the Directors say in the annual report just issued: "General satisfaction has been expressed with the new method of selling gas according to thermal value, instead of by volume. Consumers are beginning to understand that the change is one which is wholly in their interest." This is good testimony. Once get the understanding implanted in the minds of the consumers that the change is wholly in their interest, and there will be a growth of that understanding which would make a reversion to the cubic foot system a difficult matter to undertake. The time may come when any such action would be strongly resented by the public.

Gas Coal Position.

The heavier demand for the better sorts of coal and of the screened varieties is causing larger buying of the second and inferior classes, some of which have been sadly neglected. This buying of the inferior qualities is a condition the collieries very much desire, as at one time they were experiencing quite an uncomfortable accumulation of stock. Demand is effecting the

realization of the desire. In Durham and Northumberland the demand for the high-class brands for export purposes has been so great that the supply for February is said to be practically all sold. Some difficulty has also been experienced in making fresh purchases of the better class coal in Yorkshire, although regular deliveries are being made to those who have first call. The results of this are that prices for the best fuels are maintaining good strength, and there is search in the open market for any available parcels.

Coal Gas Companies and Water-Gas Making.

There is frank acknowledgment in the report of the Directors of the South Metropolitan Gas Company that the Company share any indirect advantage which may accrue from the manufacture of water gas by other gas companies. The Directors refer to the decision of the Carbon Monoxide Committee, and then add: "As this is a coal gas company pure and simple, it is not directly affected by this decision; but it shares any indirect advantage which may be derived from the popularizing of gaseous fuel by such undertakings as may use water gas in order to cheapen their cost of production." Dr. Carpenter, the President of the Company, gave notable evidence before the Carbon Monoxide Committee, against restriction in the interests of the gas industry, gas consumers, and national economy. One advantage then mentioned, which is not alluded to in the Directors' report, is that the manufacture of water gas relieves the coke market of a proportion of the output. This being so, coal gas companies must in this respect directly benefit from water-gas production.

Low-Temperature Carbonization and Gas-Works.

In the third of the communicated articles (published this week) on "The Full Utilization of Bituminous Coal," there is a paragraph towards the end which gives an emphatic expression of opinion of a close student of the subject as to the prospects of low-temperature carbonization worked independently. In his view the importance and bearings of low-temperature work will be expressed with far greater result indirectly by incorporation into existing industries—collieries, gas-works, power stations, &c.—than they can possibly hope to be outside in independent competition. In fact, he holds out very little hope on the latter lines, as the oil yield of itself is not sufficient an attraction to warrant any attempt to establish a new industry in times when permanent values hardly exist. As a market must be obtained for the gas to render the process commercially possible, the existing gas organization forms a most valuable avenue. The need for maintaining calorific value above 425 B.Th.U., and even up to 480 B.Th.U., can be satisfied by combined low and high temperature carbonization.

GERMAN GAS ASSOCIATION.

The sixty-third Annual General Meeting of the German Gas Association is to be held this year on June 26, 27, and 28, in Homburg v.d. Höhe. Dip. Ing. Tillmetz, of Frankfurt a.M., is successor as President to Herr E. Körting, of Berlin. Besides the reading of numerous papers, visits are to be made to the Frankfurt Gas-Works, to a tar-works where the products of several gas undertakings are jointly dealt with, as well as to several chemical factories in the district. An interesting feature of the arrangements is that they have been purposely made as to time and date to fit-in with the meeting of the Electricity Works Association at Wiesbaden on June 22 and 23. It is also intended to arrange on the following days meetings of the other German gas associations, such as the German equivalents of the "B.C.G.A." and the "S.B.G.I.;" thus repeating last year's highly successful experiment of making a complete "Gas Week" of it.

In his Presidential Address to the Leeds Wireless Society recently, Prof. Whiddington explained and demonstrated the use of the ultra-micrometer, his own invention—an apparatus of which principles are akin to those of wireless, and which promises to be of great value in all laboratory work where very fine measurement is required. Prof. Whiddington said the apparatus in its present form had been used in measuring gas pressure and small changes in temperature. While engineers using an ordinary micrometer gauge were very satisfied if they got within a ten-thousandth of an inch with accuracy, the ultra-micrometer enabled them to measure accurately within a thousand-millionth part of an inch.

PERSONAL.

The Leeds City Council, at their meeting last Wednesday, confirmed minutes of the Gas Committee, stating that a letter had been received from Mr. WALTER HOLE tendering his resignation of the position of Superintendent of the Mains and Distribution Department, to take effect from March 31. It was resolved that the resignation be accepted with regret, and that the Sub Committee place on record their high appreciation of Mr. Hole's services during the past 24 years. It was further resolved that, on the understanding that Mr. Hole renders such service as may be required by the Gas Department during the twelve months following his resignation, an allowance be granted to him equivalent to six months' salary. We understand that Mr. Hole is coming South, and that he will devote part of his time to consultant work.

As was recorded in last week's "JOURNAL," Mr. J. F. SIMPSON, M.A., B.Sc., Assistant Engineer at the Nelson Corporation Gas-Works, has been unanimously appointed by the Scunthorpe and Frodingham Urban Council as Engineer and Manager of their gas undertaking, in succession to Mr. SAMUEL MOORE (who has accepted the position of Managing-Director of Moore's Gas Generator Syndicate, Ltd., No. 1, Upper Woburn Place, W.C. 1). We are sorry to learn that Mr. Moore is at present suffering from influenza; and readers will join with us in wishing him a speedy recovery, and all success in his new enterprise. The Scunthorpe people claim that theirs is one of the most brilliantly lighted towns in the kingdom, although for months past the make of gas has been close upon 30,000 c.ft. per ton of coal carbonized.

The resignation of Mr. W. BATES, Gas Manager at Poulton, has been accepted by the Gas Committee of the District Council; and it has been decided to advertise for a successor.

OBITUARY.

WILLIAM H. BRADLEY.

It is with much regret that we learn of the death suddenly, from heart failure, on the 18th ult., of Mr. William H. Bradley, Chief Engineer of the Consolidated Gas Company of New York. Death took place in his office, in the Gas Company's building, so that a desire which he had expressed "to die in harness" was fulfilled. He had been Chief Engineer for 36 years.

Mr. Bradley had lived a very active life, and had been the principal moving spirit in many very large constructional engineering propositions. Though 84 years old, he was a daily visitor to his office, where he took delight in studying plans and watching the daily details of the manufacture of gas, and its distribution. Ten days before his death he, accompanied by several officers of the Consolidated Gas Company, visited the works of the Astoria Light, Heat, and Power Company, at Astoria, Long Island, where he turned the large bar that started the flow of gas into the newly completed 15 million c.ft. holder, which was described in the "JOURNAL" for Oct. 19 last. This was the second holder of that capacity which Mr. Bradley had seen completed to plans and specifications prepared by himself. Word of the death of Mr. Bradley was immediately communicated to Mr. G. B. Cortelyou, the President of the Company, and Vice-Presidents Walter R. Addicks, Robert A. Carter, and Charles G. M. Thomas, and to the heads of departments, who remained at the building until Mr. Bradley's body had been transferred to his home.

Mr. Bradley was born in New Haven (Conn.) on Aug. 25, 1838; and while still a resident in the town he served in the mechanical department of a large manufacturing establishment. Subsequently he entered the service of the Continental Iron-Works, Brooklyn (N.Y.), as Constructional Engineer. At that time the Company were actively engaged in the execution of large Government contracts. Mr. Bradley later became interested in the discovery of oil in Western Pennsylvania, which took him to that State; and there he established a machine and boiler shop, and engaged in the manufacture of oil-well drilling tools. He came back to New York City in 1870, and again became the Constructional Engineer of the Continental Iron-Works, taking charge of the gas plant and gasholder department, planning, superintending, and erecting gas plants in various parts of the country. One of the plants built under his supervision was that of the Municipal Gas-Works in West Forty-Fourth Street, New York City; and after the completion of those works in 1876, he remained with the Municipal Gas Light Company as their Engineer, at the same time acting as Engineer for the Metropolitan Gas Light Company.

The Consolidated Gas Company were incorporated in 1884; and two years later Mr. Bradley became Chief Engineer of the newly-formed Company. In the late seventies, Mr. Bradley became convinced that the illuminating power of coal gas could be greatly increased by the infusion of oil. At that time the Standard Oil Company were disposing of immense quantities of an oil for which no use had been found. Mr. Bradley called on Mr. Henry H. Rogers, and asked him if he could have the use of some of the oil that was being thrown away. Mr. Rogers told Mr. Bradley he could have all he wanted. Mr. Bradley took the oil up to one of the old gas-works, and there experimented, not only in enriching coal gas with it, but on what is known to-day as

carburetted water gas. His experiments having been successful, Mr. Bradley made a contract with Mr. Rogers, whereby he purchased the oil for one cent a gallon. This oil subsequently became known as naphtha, and later as gasoline. The price of the oil, however, because of its many uses, jumped to a figure that made it impossible to use it for gas-making purposes; and in its place gas-oil is used to-day.

Mr. Bradley, on entering the service of the Consolidated Gas Company of New York, made an extended trip to Europe, where he studied the gas plants in various countries; and on his return, he gave an extended report on all the properties of the Consolidated Gas Company and policies for future guidance to meet the phenomenal growth of that city. His survey led him to report that the time would come when the manufacture of all the gas necessary for the city would have to be made in some place other than on Manhattan Island. From two or three properties, he selected the present site of nearly 400 acres at Astoria (Long Island), where the Astoria plant, the largest in the world, is now in operation. This plant, which has a daily capacity of 86 million c.ft. of gas, was constructed to plans and specifications in every detail as Mr. Bradley had drawn them. The equipment of the retort-houses, the scrubbers, the tar-extractor houses, and coal-handling apparatus, as they are to-day, were all designed by Mr. Bradley.

Mr. Bradley leaves a wife, a daughter, and two sons—Mr. George Bradley, Assistant Engineer of the Nevins Street plant of the Brooklyn Union Gas Company, and Mr. Charles W. Bradley, Gas-Engineer of the People's Gas Light and Coke Company, Chicago. Mr. Bradley was President of the American Gas Institute in 1909 and 1910, and a member of numerous technical gas associations and societies.

CHARLES VICTOR TOWNSEND AND HARRY TOWNSEND.

Readers of the "JOURNAL" will doubtless remember the announcements which appeared in our columns at the time of the deaths in action of two sons of Mr. H. Townsend, of Wakefield. These two boys were educated at the Wakefield Grammar School, which lost 82 old boys and masters in the war. A handsome memorial has recently been erected to their memory, bearing the names in bold letters on bronze tablets upon a granite pedestal, the whole surmounted by a life-size figure in bronze of a bugler in the act of sounding the "Last Post."

In a commemoration number, a short account appears of each of the 82 who made the great sacrifice, culled from the monthly School Magazine. Among them are the following descriptions of Mr. Townsend's two sons; and it may be of interest to those who knew them to read the opinions held of them by their schoolfellows and masters.

CHARLES VICTOR TOWNSEND—1900-1903.—Second-Lieutenant, King's Shropshire Light Infantry, was killed in France, March 21, 1916. Mentioned in Despatches.

Charlie Townsend was the elder of two brothers who were almost inseparable both at school and afterwards. He had attained considerable eminence in his profession, and at the outbreak of war was Manager of the Hereford Gas-Works. Of a naturally genial temperament, he was loved by all; and the numerous letters received by his parents from his fellow officers show the esteem and affection felt by them. He was a man absolutely without fear, and was constantly taking part in dangerous expeditions. That he was appreciated by his superiors is proved by the fact that he was mentioned for gallant conduct in General Sir Douglas Haig's recent despatches. The School and Old Savilians' Club have had no more loyal supporter; and they are both the poorer for the loss they have sustained.

HARRY TOWNSEND—1900-05.—Second-Lieutenant, 4th Battalion King's Own Yorkshire Light Infantry, reported missing July 19, 1916, presumed by the War Office killed Jan. 23, 1917.

Harry Townsend served six months in the ranks, and was then given a Commission in the 11th K.O.Y.L.I. Subsequently he was transferred to the Machine Gun Corps. In the Battle of the Somme, the infantry were fighting in Delville Wood, and the Machine Gun Corps were waiting in a front line trench for the orders to go forward. No orders being forthcoming, Townsend and his orderly were sent forward to reconnoitre; and since then nothing more has been heard of them. His father has since received from a New Zealander a letter of his son's found in the wood, pierced by a bullet, and stained with blood.

Thus poor Harry Townsend has not been long parted from his brother Charlie. In life they were almost inseparable, and in death they are not divided. Brothers of a more charming disposition are not often met with; and we were always delighted to see them at any of our functions. They in their turn loved their old school, and none rejoiced more at its success. To their father in his deep sorrow—and no one has had more in these last two years—we offer our respectful and sincere sympathy. With the lady who had become engaged to Harry Townsend, herself a sister and a sister-in-law of two respected Savilians, we can only ask to be allowed to sorrow also.

Midland Association of Gas Engineers and Managers.—The Hon. Secretary (Mr. T. Thornton) informs us that the annual general meeting will be held in Birmingham, on Thursday, March 9.

Scottish Junior Gas Association (Western District).—At a meeting of the Association in the Technical College, Glasgow, next Saturday evening, Mr. William Hogg, of Glasgow, will read a paper on "Distribution Topics."

ELECTRICITY SUPPLY MEMORANDA.

THERE is something strange and even mysterious about electric heating and cooking. They are not making the progress that the electricity advocates would like to see. Electrically asserted, there is nothing like electricity. Nevertheless, there is a remarkable divergence between the statements of the electrical advocates and public patronage. The two cannot be reconciled, however much we try to concentrate upon them, and even to bring imagination to our assistance. Electricity for cooking and heating possesses every virtue (so we are told) that it is possible for an agent for providing heat to have—in fact, electrical heat (we are asked to believe) has some physical property that heat generated by other means has not. We do not profess to understand this; but there are electrical men who speak as if this were so. Yet the public give the bulk of their patronage elsewhere. The electricians should inquire why this is. It is not because electric cooking and heating are something new. They have been in the market place for many years; still in magnitude of use and increase of use gas takes precedence of electricity. This is a matter that should be investigated by the electrical people. It is all very well to tell each other of the economical and other advantages of electricity; but if they can ascertain the reason or reasons for, relative to gas, a sluggish adoption of electric cooking and heating, they will have a starting-place for working to annihilate the retarding causes, and, if this be possible, to develop the business at quicker pace in both directions.

What is the Reason?

A Difficult Task.

The third conference on Salesmanship, organized by the Electrical Development Association, has been held; and at it Mr. W. A. Gillott opened a discussion on "Salesmanship in Relation to Cooking and Heating." The same old tale was heard. The merits of electric cooking and heating were duly paraded. They were all there—from cost economy to food savings. The salesmen present had probably heard them all before. If they had not, they have been asleep; but those who have not been asleep would have been glad to have heard something fresh. But there was some sound advice in Mr. Gillott's opening, which would apply as much to gas salesmen as to men engaged in the same work for electricity. He strongly advised them not to run-down the competitor, but only to give positive and demonstrable facts regarding it. That is all gas men ask for. Things would be much easier if so much time had not to be taken up in controverting the statements born of pure malignity. The electrical salesman must also be educated up to acting in an advisory capacity. That is very essential, judging by the effects of some of their recommendations. It is necessary to know the subject thoroughly, so that advice can be given as to the methods that will secure the best results. Familiarity with kitchen language and tact are therefore essential qualifications. It has been rumoured that, where there is electrical operation, kitchen language is not always of a desirable purity. A study of the principles of cooking and heating is likewise necessary in order to be able to point out the "advantages" of using electricity as compared with other methods. That is difficult; and so the study must be mightily profound. Further, electric salesmen must know their competitor. They must know and understand not merely the main principles, but must ascertain the competitor's methods of attack. It is evident that Mr. Gillott is fully persuaded that the electric salesman has an awkward task before him, despite the ascribed wonderful merits, and therefore that he must know a lot, and be exceptionally well equipped. He speaks from experience; and so we are not surprised at the completeness of his prescribed curriculum for electric salesmen.

Points.

A very sage piece of counsel is given by Mr. Gillott. There are good grounds for it. He advises electric salesmen that it is as well not to talk too much about price, but to keep cost in the background until the prospective buyer is interested. Quality, he says, is the thing to talk about. Get this well rammed home; then the desire for possession will have been created, and it will be found that cost is a secondary consideration. Electric salesmen must not deceive themselves. Cost is not a secondary consideration. It is a very real and primary cause of the comparatively slow growth of electric cooking and heating. Electric salesmen know it; and nothing that Mr. Gillott can say, or has said, will destroy that knowledge. Then the electric mentor counsels that electric cooking and heating should be supported by positive facts. That is as things should be. He names certain points that should be emphasized. Let us see what they are. In the first place, there is the cleanliness of electricity. Electric cooking like gas cooking is only cleanly so long as the user will allow it to be so. But electric heating elements are not the easiest things in the world to keep clean. We have seen some smothered in the burnt accumulations of grease splashings. The next point is "satisfactory cooking results obtained." This depends upon the ability of the cook. There is nothing about electricity that eliminates the human factor. We have seen meat electrically cooked (or supposed to be) with well-done exterior and much under-done inside; we have seen pastry and cakes with very

anæmic-looking exteriors. The third point is "low labour costs." Naturally—compared with the coal fire, but nothing in this respect superior to the gas-cooker; and it may be added that, as labour applies to time as well as to energy, the gas-cooker is superior to the electric cooker in respect of low labour requirement. "Convenience and safety" constitute a fourth point. There is nothing more convenient about electric cooking than gas cooking; and as for safety, well, we have heard and known of unpleasant experiences for the cook, and we have heard and known of consumers' wrath in having a collapse of the heating energy just in the middle of cooking. No, Mr. Gillott, experience informs us this is not all gospel; there is another side to the tale. The same applies to the fifth point—that cooking by electricity is economical. When electric "cooking" comprises all that is done by a gas-cooker (the utility range of which cannot be beaten by any electric-cooker), the result is not economical. Moreover, economy comprises all costs—initial and otherwise.

Things to Memorize.

Mr. Gillott gives some details—useful ones, he describes them—which should be memorized. He says that in cooking for middle-class families, the consumption of electricity averages 1 unit per person per day. This depends on the requirements of the people concerned. One cannot generalize. He adds that "with electricity at 1d. per unit, it is equivalent in fuel cost to gas at 2s. 6d. per 1000 c.ft." If that is the sort of thing the electric salesman is to memorize, and trot-out parrot-like, he will get himself into serious trouble. We assert deliberately, because we know it to be true, that Mr. Gillott will not and cannot get out of his electric cooker the same quantity and like character of work that we can realize from a gas-cooker for a penny, with gas at 2s. 6d. per 1000 c.ft. As to heating for rooms and small offices, he says that an allowance of 1 watt per cubic foot of room space is approximately correct. Other than for very few places it would not be even approximately correct. The usual specification is 2 watts per cubic foot of room space; but even 3 or 4 watts are necessary in rooms in some situations and in certain weather conditions. There is no general rule as to "fuel" expenditure that will apply, owing to the circumstances—structural and atmospheric—in which heating is required not being uniform. Because the circumstances vary so considerably—the extremes being very wide apart—the greater the range of capacity of the heating agent the better, and the greater range is with gas. Then we see that another thing to memorize is that 1 unit of electricity will, with self-contained water urns or kettles (expensive things!), boil 1 gallon of water in half-an-hour under average conditions. Working this out, it means approximately 50 p.ct. efficiency, which is not continuous through the life of the articles. If a self-contained vessel has only 50 p.ct. efficiency, what is the efficiency of the boiling elements accompanying the electric-oven, and which have to do more work than the self-contained vessel, and be subject to rougher usage? There is a great difference in the efficiency to be obtained from heating elements; and it shows a decline with age. It is no use for Mr. Gillott to say it is not so. We are not making the assertion without the guidance of the results of practical and experimental experience, for the purpose of ascertaining the truth of these matters.

Costs.

Then Mr. Gillott gives the cost of electricity for his own home with a family of six and an "average number" of visitors. No coal is used from the middle of March to the middle of October; so that for five months coal is used, and its cost has to be added to expenditure on electricity. Not even the economy and all the other virtues of electrical operation—not even the 1 watt per cubic foot of room capacity—prevent Mr. Gillott having recourse to crude coal heating for five months of the year. There is something wrong as between argument and practice. However, we see that for lighting 186 units are used by him per annum, for cooking 2336 units, and for heating 1156 units—heating including all hot water from the middle of March to the middle of October. The units total to 3678; and the cost of the electricity for all purposes is £27 19s. 6d. Dividing this sum by 3678 units, we have a charge of 1½d. per unit, which is not what the average would be to-day in most electricity supply areas. It shows that a low heating and cooking rate is charged in Mr. Gillott's account. Besides this Mr. Gillott's figures are from a specialist's household, where things electrical (if anywhere) would be kept in perfect order, and where it would be seen that the maximum possible value in work was obtained from the expenditure of the heating energy. These conditions are not comparable with those that obtain in an ordinary household. Adding the cost of coal to the £27 19s. 6d. for the five winter months—say, only another £12 at current prices—that would make practically £40 a year for lighting and heating, even with the low average charge for electricity.

Practice and Faith.

Both in the paper and the discussion, there was plenty of evidence—particularly in the latter—that there exists much room on the sales side of the electricity business for the advice that Mr. Gillott offered to the industry's salesmen. Complaint was made by more than one speaker that it is often found that heaters are recommended that are too small for the warming of large rooms. Also that heaters of too large a capacity are sometimes recommended for the heating of small rooms. Both these solecisms result in trouble with the users; and the advertisement of unfitness and expense does no good to electrical heating. Then there was assertion that electrical people have not much faith in electrical apparatus. They have no doubt good reason for it. We know some of them have. They were also charged with not putting to use in their own households electrical appliances to the extent they should. They know the cost; they know the trouble that frequently arises, when, if they are not on the spot to put things right, they have an uncomfortable time of it when they do arrive there. Moreover, electrical engineers are not responsible for their own household management; and the preferences of wives and others in the household have to be consulted. It is the same old story in different words. All the time the connection of gas-fires and other heating appliances romps along merrily.

Inefficiency and Waste Heat.

The Institution of Electrical Engineers and the Institution of Heating and Ventilating Engineers have had a joint meeting to discuss the question of the utilization of waste heat in generating stations. There were two papers—one by Mr. C. Ingham Haden, and the other by Mr. F. H. Whysall; but these communications and the ensuing discussion leave the matter just as much in the air as before. The profitable use of the heat at present lost, and the abandonment of condensers, seem as far off as ever. There was advocacy that the waste heat should be utilized; but how to do it, with an assurance of profit, is quite another matter. There is the heat. The want of coincidence of the electrical load with the demand for heat is something that cannot be got over without a complete modification of the customs and habits of the people. Besides, without unduly high expense and loss, there can only be transmission in the immediate neighbourhood of a station. On the occasion, the electrical engineers present must have felt somewhat uneasy on being reminded with blunt frankness of the great inefficiency of their generating process. The domestic coal grate can, with all its crudeness, show a higher efficiency. It is speaking kindly to put the present average efficiency of the generating stations of the country at 5 p.ct., though it is hoped that the new power stations will run up to 8 p.ct. Mr. Haden pointed out that an up-to-date boiler plant (this would be a very good one) shows an efficiency of 80 p.ct. obtained from the coal; so that, assuming the calorific value of the coal to be 14,000 B.Th.U., 20 p.ct. is lost in the boiler, and 90 p.ct. of the remainder in the generating plant. In other words, out of a total of 14,000 B.Th.U. per pound of coal, only 1120 B.Th.U. are converted into electrical energy. Then Mr. Haden told how, if the fuel consumption of the electricity generating stations of the country is 10 million tons per annum, the huge total of 9 200,000 tons represent the approximate value of the wasted heat. That is something over which to ponder. Mr. Haden also declared that, in spite of the cleanliness and adaptability of electricity, it is a most wasteful form of heating if coal is to be conserved. He held that no scheme of electricity generation could be considered complete if it did not make provision for the utilization of waste heat. In view of the fact that the waste heat could only be used locally, he considered the schemes of super-stations and the scrapping of local stations would be most calamitous.

ADAPTING MANTLES TO GAS QUALITY.

Prominent makers of gas-mantles in Germany have been giving their attention to the question of suiting their products to the gas which is sold under modern conditions. The success which has attended their investigations is described in an article in "Das Gas und Wasserfach" on what the makers have called the "economy mantle."

The quality of gas is altered, but not necessarily for the worse from the technical point of view, by the almost general addition of high percentages of water gas. It is true that the calorific value is lower; but the flame temperature is higher. For this reason, the addition of water gas is a favourable factor as regards incandescent lighting, and indeed all other uses of gas in which flame temperature is more important than calorific value. But where burners and mantles of the old patterns are used without modification, the reduction in the size of the flame is apt to give rise to very bad lighting results. The smaller flame—due to the alteration in air consumption and flame velocity—no longer fits the mantle, and, the inner cone being removed from the fabric, the latter is not in the zone of greatest heat. The firms in question have been successful in altering mantles to suit modern gas consumed in existing burners, and at the same time they have reduced the gas consumption without materially reducing candle powers.

The new mantles were submitted to the Gas Institute at Karlsruhe, where comparative tests were made (1) with gas containing 14·3 p.ct. of inerts; (2) coal gas with 10 p.ct. of water gas added; (3) with 21·5 p.ct. of water gas; (4) with 45 p.ct. of water gas. With the upright mantles (the whole mantle being incandescent—as compared with the imperfect heating of the old mantle) the saving in gas was between 19 and 24 p.ct. The alteration in candles per cubic foot was slightly in favour of the new mantles; and the best results were obtained with gas containing 20 p.ct. of water gas. With inverted mantles the saving in gas was between 21 and 23 p.ct., and the candles per cubic foot improved by 17 to 22·5 p.ct.

GAS LIGHT AND COKE COMPANY.

Annual Report and Accounts.

THE following is the report of the Directors of the Gas Light and Coke Company for the year ended Dec. 31, which will be presented at the Ordinary General Meeting next Friday.

The accounts for the year show that after paying, in respect of the June half year, dividends at the rate of 4 p.ct. per annum on the 4 p.ct. preference stock, 3½ p.ct. per annum on the 3½ p.ct. maximum stock, and £4 13s. 4d. p.ct. per annum on the ordinary stock, and after contributing a sum of £10,000 to the redemption fund, there is a total available balance of £661,411 2s. 9d., out of which the Directors recommend the payment of the following dividends in respect of the December half year: On the 4 p.ct. preference stock, at the rate of 4 p.ct. per annum; on the 3½ p.ct. maximum stock, at the rate of 3½ p.ct. per annum; and on the ordinary stock, at the rate of £4 13s. 4d. p.ct. per annum; which, together with a further sum of £10,000 to be contributed to the redemption fund, will absorb £517,054 2s. 4d., and leave £144,357 0s. 5d. to be carried forward to the credit of the current year.

In January last the Board of Trade revoked the Company's Order under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, and on March 23 they made an Order under section 1 of the Gas Regulation Act, 1920. This Order abolished the old standard price of 3s. 2d. per 1000 c.ft., and substituted a new standard price of 1s. 3·2d. per therm.

In April, the Company declared the calorific value of the gas to be supplied to be 475 B.Th.U.

The Directors are pleased to announce that, as from the readings of the meters for the December quarter, the price of gas has been reduced to 1s. 1d. per therm.

The Government control of coal came to an end in the month of March; and a stoppage began in the coal mining industry on April 1, and continued, without intermission, until July. The Directors are pleased to report that neither the pressure nor the quality of the Company's gas was interfered with during this period. The cost, however, of this industrial dispute to the Company was not far short of £500,000.

The Directors regret to report that Mr. John Miles, who had been a Director of the Company for nearly 23 years, during which period he was Deputy-Governor for three years and Governor for over two years, died in March last. The Directors elected the Hon. Clive Bigham, C.M.G., C.B.E., in his place.

The Directors also regret to report the death in November of Mr. H. J. Waterlow, who had been a Director of the Company for fifteen years, during which period he was Deputy-Governor for five-and-a-half years. Mr. Godlee was elected to succeed Mr. Waterlow as Deputy-Governor; and the vacancy on the Board was filled by the election of Mr. Thomas Goulden, M.Inst.C.E., who since 1904 had been the Chief Engineer to the Company.

Mr. T. Hardie, M.Inst.C.E., the Deputy Chief Engineer, has been appointed to succeed Mr. Goulden as Chief Engineer to the Company.

There has been an addition for the year to the Company's consumers of 4981, and an increase of 39,065 in the number of gas-stoves sold and let-out on hire. The Directors resumed the letting-out of gas-fires on hire in October; and the large demand which immediately followed showed that the public thoroughly appreciated the return to the Company's usual practice.

The sales of gas show a decrease of 5 p.ct. This is due to the coal dispute, to the general depression in trade, and to the extraordinarily fine weather prevailing throughout the year.

Application is being made to the Board of Trade for an Order under section 10 of the Gas Regulation Act, 1920, to authorize the acquisition by the Company of the undertaking of the Ilford Gas Company, and for other purposes. The clauses of the draft Order will be explained to the proprietors when it is submitted for their approval at an extraordinary meeting, which will be held immediately after the close of the ordinary general meeting.

DAVID MILNE WATSON,
Governor.

Horseferry Road, Westminster, S.W. 1, Jan. 27, 1922.

The Accounts.

The statement of capital (stock) sets forth that the total paid-up is £10,413,480; added on conversion, £12,832,955—total amount authorized, £23,246,435. Deducting the amount redeemed, £285,225, the total amount of the Company's existing capital powers is £22,961,210. The statement of loan capital stands thus: Total paid-up, £3,186,660; added on conversion, £1,618,190; unissued, £750,000—total amount authorized, £5,554,850.

The capital account shows receipts (with premiums, £1,688,958) to the amount of £29,455,017. The expenditure is shown in the following items:

	Expended this Year.	Total to Dec 31, 1921.
Expenditure to Dec. 31, 1920		£14,679,630 7 3
Expenditure during the year to Dec. 31, 1921—		
Lands acquired, including law charges	£23,133 17 0	
Buildings and machinery in extension of works	106,690 0 9	
New and additional mains and service-pipes	70,393 1 2	
Do. do. meters	55,816 17 9	
Do. do. stoves	58,912 15 10	
		314,946 12 6
		£14,994,576 19 9
By amount written off plant	£9,120 0 0	
„ depreciation of stoves	46,195 0 0	
		55,315 0 0
Total expenditure		£14,939,261 19 9
Nominal amount added on conversion		14,451,145 0 0
		£29,390,405 19 9
Deduct amount of capital redeemed under the Company's Act of 1903		285,225 0 0
		£29,105,181 19 9
Balance of capital account		349,835 14 11
		£29,455,017 14 8

REVENUE ACCOUNT.

Revenue.

Year, 1920.		£ s. d.	£ s. d.
£7,094,524	Sale of gas— Per meter at 4s. 8d. and 5s. 6d. per 1000 cubic feet and 1s. 2d. and 1s. 1·2d. per therm	7,811,114 7 5	
171,827	Public lighting and under contracts	233,954 6 0	
7,266,351			8,045,068 13 3
162,892	Rental of meters	..	166,176 16 11
190,746	Rental of stoves	..	192,915 15 9
313,235	Rental of fittings	..	300,375 12 5
	Residual products—		
3,662,610	Coke, less labour, &c.	1,945,506 3 1	
158,300	Breeze, less „ „	199,908 18 6	
690,330	Tar and tar products	222,432 4 10	
327,974	Ammoniacal liquor and sulphate of ammonia	129,990 10 9	
4,839,214			2,497,837 17 2
17,779	Rents receivable		29,390 5 2
604	Transfer fees		594 12 6
12,790,821			11,232,359 13 2

Expenditure.

Year, 1920.		£ s. d.	£ s. d.
£5,318,864	Manufacture of gas— Coal, including expenses	4,190 853 9 6	
215,824	Oil „ „ less value of oil tar	514,518 8 1	
335,166	Coke, &c., used in the manufacture of carburetted, &c., water gas	476,492 17 7	
65,435	Salaries of engineers and other officers at works	72,401 6 4	
662,502	Wages	538,475 11 0	
75,098	Purification	76,935 16 1	
2,247,598	Repair and maintenance of works and plant, materials, and labour, less received for old materials, £11,941 7s. 8d.	1,627,933 5 11	
	Distribution of gas—		7,497,610 14 6
315,392	Salaries and wages of officers (including rental clerks)	337,066 19 5	
596,308	Repair and maintenance of mains and service-pipes, &c.	454,873 19 3	
398,681	Repair and renewal of meters	268,829 18 6	
386,174	„ „ stoves	269,751 8 1	
19,941	Fitting up automatic meter supplies	36,397 12 10	
			1,366,919 18 1
173,522	Public lamps—lighting and repairing	..	157,530 1 0
	Rents, rates, and taxes—		
15,713	Rents payable	16,357 1 3	
574,633	Rates and taxes	576,974 13 10	
			593,331 15 1
	Management—		
7,500	Directors' allowance	7,500 0 0	
600	Company's Auditors and assistant	604 4 0	
44,147	Salaries of management staff	48,677 10 5	
153,332	Collectors and cashiers	164,959 5 8	
34,053	Stationery and printing	38,614 17 3	
40,396	General charges	48,483 0 9	
			308,868 18 1
42,877	Co-partnership	..	64,962 11 0
190	Parliamentary charges	..	411 14 10
657	Law charges	..	1,722 5 11
2,000	Charges *re* quinquennial re-valuations	..	869 3 7
5,268	Bad debts	..	8,807 19 3
1,000	Depreciation fund for works on leasehold lands	..	1,000 0 0
116,671	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	86,199 7 5
204	Allowances to employees on active service	..	—
7,799	Workmen's compensation	..	8,621 18 6
16,306	Company's Contribution under National Insurance Acts	..	31,273 15 4
	Public officers, &c.—		
1,929	Contribution under Gas Regulation Act, 1920, and Official Auditor	5,191 11 1	
1,506	Public testing-stations	1,560 4 7	
			6,750 15 8
11,877,286			10,134,880 18 3
913,535	Balance carried to net revenue account		1,097,478 14 11
12,790,821			11,232,359 13 2

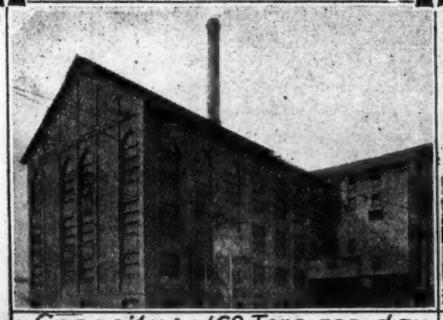
Total Wages Paid 1921, £2,991,523 7 0. Total Salaries Paid 1921, £491,657 14 6.

WOODALL-DUCKHAM VERTICAL RETORTS

FIRST IN 1903 — FOREMOST IN 1922

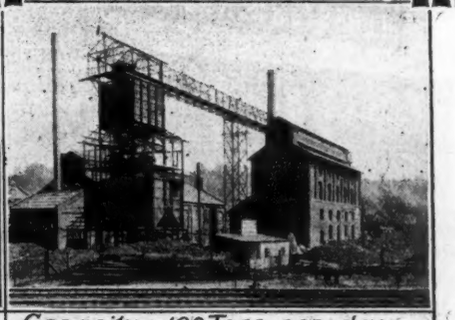
VERTICAL RETORTS ON THE W-D SYSTEM IN THE UNITED STATES OF AMERICA.

NEWHAVEN (CONN)



Capacity: 160 Tons per day

SCHENECTADY (N.Y.)

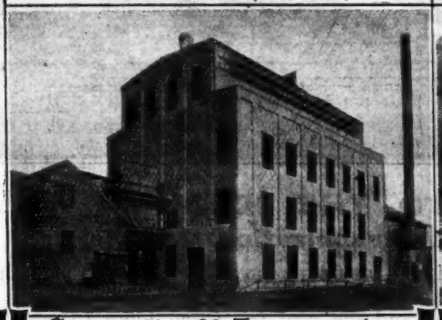


Capacity.: 100 Tons per day

1910.—La Grange (Ill.).
1911.—Derby (Conn.). (1st Install.)
1912.—Holyoke (Mass.).
1913.—Schenectady (N.Y.).
Derby (Conn.). (2nd Install.)
Brockton (Mass.).
New Haven (Conn.).
1914.—Massena Springs (N.Y.).
(1st Installation.)

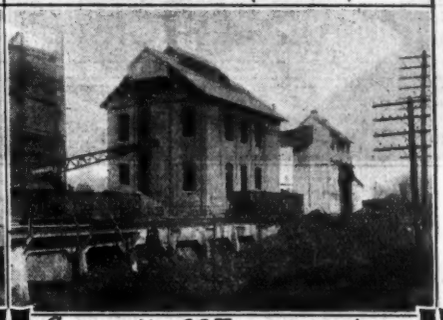
1916.—Meriden (Conn.).
Badin.
Massena Springs (N.Y.).
(2nd Installation.)
1917.—Niagara Falls (N.Y.).
Maryville (Tenn.).
Massena Springs (N.Y.).
(3rd Installation.)

HOLYOKE (MASS.)



Capacity: 60 Tons per day

MERIDEN (CONN.)



Capacity: 60 Tons per day

WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION Co. (1920) Ld.

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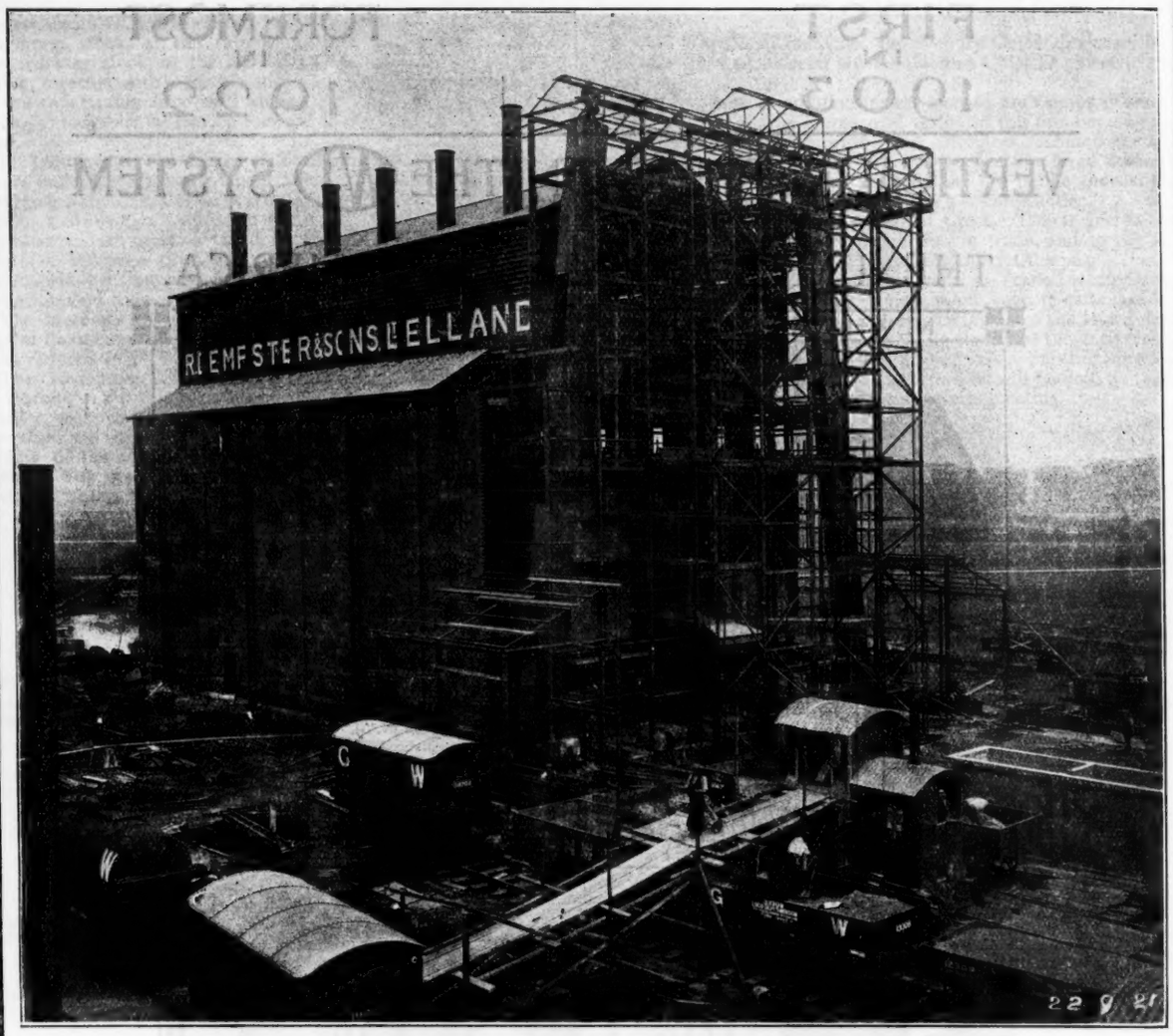
SWINDON G.W.R. 3,000,000 INSTALLATION.



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"We follow a most fascinating profession—in fact, we follow one of the ideals of the engineer, in rendering serviceable to the community that great resource of nature—COAL.
In this country our seams are getting deeper and the coal is costing more to mine, and therefore it is incumbent upon us to husband our resources to the utmost extent.
Now in providing means of Light, Heat and Power, as we do by the manufacture of gas, we claim—and we know that we rightly claim—to deal with this great asset of the country, Coal, in the most economical manner. Therefore, I am proud to be a Gas Engineer."

October, 1921. THOMAS GOULDEN, *President of the Institution of Gas Engineers.*

We likewise are proud to be in a position by means of our "Dempster-Toogood" System of Steamed Continuous Carbonization to assist Gas Engineers in the better attainment of this ideal.

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ELLAND.

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The total of the net revenue account is £1,421,076. The following statement shows how it is appropriated:

Year, 1920.			
£153,246	..	Interest on debenture stocks and bonds for the year	£153,245 10 0
37,954	..	Interest on temporary loans and sundry funds, less credits	92,363 19 1
		Dividend, &c., for the half year to June 30, 1921:	
81,245	..	Dividend on the 4 p.c. consolidated preference stock, £81,244 14s.	
34,125	..	Dividend on the 3⅜ p.c. maximum stock, £45,500	
..	..	Contribution to redemption fund, £10,000	
£3 per cent.	..	Dividend on the ordinary stock (£4 13s. 4d. per	
244,484	..	cent. per annum), £380 309 8s. 4d.	
359,854			517,054 2 4
686,452	..	Balance applicable to redemption und and to dividends, December half year, 1921	661,411 2 9
£1,237,506			£1,424,076 14 2

Proposed Appropriation of Balance on Net Revenue Account, Dec. 31, 1921.

Year 1920.		£ s. d.	£ s. d.
£636,452	Balance	..	651,411 2 9
	Amount required for dividends, &c., for the half year to Dec. 31, 1921:		
£81 245	Dividend on the 4 p.c. consolidated preference stock	81,244 14 0	
34,125	Dividend on the 3⅜ p.c. maximum stock	45 500 0 0	
..	Contribution to redemption fund	10,000 0 0	
£3 p.c.	Dividend on the ordinary stock, £4 13s. 4d. p.c. per annum on		
£244,484	£16,298,975	380,309 8 4	
£359,854			517,054 2 4
£326,598	Balance carried to next year's account	..	£144,357 0 5

The three statements relating to the reserve, special purposes, and depreciation funds stood as follows on Dec. 31: Reserve fund, £90,684; special purposes fund, £385,167; depreciation fund, £101,601.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the year as follows: Coal, £364,674; gas oil, £72,928; coke, £45,639; tar and ammoniacal liquor and products, £174,062; and sundries, £828,757. The figures this time last year were: Coal, £543,525; gas oil, £262,334; coke, £123,258; tar, ammoniacal liquor, and products, £172,164; sundries, £896,271.

Statement of Coal.

—	In Store Dec. 31, 1920.	Received during Year.	Carbonized during Year.	Used during Year.	In Store Dec. 31, 1921.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	231,390	1,795,654	1,836,935*	3793	186,316

* In addition to this quantity of coal, 14,132,779 gallons of oil have been used during the year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1920.	Made during Year.	Used during Year.	Sold during Year.	In Store, Dec. 31, 1921.
Coke—tons	60,627	1,152,669	208,867	974,003	30,426
Breeze—tons	21,942	321,566	29,180	300,370	13,958
Tar, from coal only—galls.	2,214,707	16,430,551	16,147,353	9,483	2,488,422
Ammoniacal liquor—butts	31,192	471,502	468,783	..	33,911

Statement of Gas Made, Sold, &c.

		Quantity Made.	Quantity Sold.			Quantity Used on Works, &c.	Total Quantity Accounted for.	Quantity Not Accounted for.	Number of Public Lamps.
			Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).	Total Quantity Sold.				
1921.	Cubic feet (thousands)	† 33,443,596	887,838	29,494,694	30,382,532	531,830	30,914,362	2,529,234	44,150
	Therms	161,091,843§	4,277,023	142,071,280	146,348,303	2,561,697	148,910,000	12,181,843	..
					*(144,317,027)				
1920.	Cubic feet (thousands)	35,148,709	964,548	30,998,905	31,963,543	554,326	32,517,869	2,630,840	44,479
	Therms	170,612,289	4,687,118	150,480,232	155,167,350	2,691,908	157,859,258	12,753,031	..

* At declared calorific value, viz., 475 British thermal units per cubic foot.
† Including 11,043,712 thousands of carburetted, &c., water gas.
§ At actual calorific value, viz., 482 British thermal units per cubic foot.

SOUTH METROPOLITAN GAS COMPANY.

Annual Report and Accounts.

THE following is the report of the Directors of the South Metropolitan Gas Company for the year ended Dec. 31, which will be presented at the general meeting to-day [the 8th inst.].

The Bill for amending the capital powers of the Company and for other purposes, which was approved by the proprietors at the extraordinary general meeting held in February, 1921, passed without opposition through both Houses of Parliament; and in July an issue was made of £734,000 6½ p.ct. redeemable debenture stock. The fact that, within a few hours, the stock was applied for seven times over, is a clear indication of the position held by the Company in the public estimation.

As a result of the three months' stoppage in the coal industry, the Company, while maintaining the quality and quantity of its gas supply throughout, was involved in an additional expenditure for coal of over £350,000. The price of gas, therefore, was increased by 1d. per therm at Midsummer, representing an additional revenue of about £150,000; and the balance has been charged to suspense account, to be liquidated during the current half year. Under these circumstances, the Directors cannot recommend a higher dividend than at the basic rate of 5 p.ct. per annum.

There has been a decrease of 1·8 p.ct. in gas sales, whereas, in the previous year, there was an increase of 5·4 p.ct. This is attributable in part to the exceptional weather conditions of the last six months, and in part to the general depression in trade and industry. The high price of gas (though the lowest in the London area) has also undoubtedly been a contributing factor; and it is for this reason that it is proposed to spread the exceptional charges due to the coal stoppage over two half-years. The falling cost of coal, materials, and labour must soon react in cheapening production, thereby enabling gas to be sold at a figure more within the spending power of the consumers. It is gratifying to report that consumers have increased in number by 2386, and that 10,278 additional stoves, in addition to a large number of other appliances, have been sold or let on hire during the year.

General satisfaction has been expressed with the new method of selling gas according to thermal value instead of by volume. Consumers are beginning to understand that the change is one which is wholly in their interest. That the thermal value declared by the Company has been fully maintained is proved by the results of between six and seven thousand tests carried out during the year by the London County Council Gas Examiners.

After an exhaustive inquiry by a Committee appointed by the Board of Trade in the early part of last year, it was decided not to place restrictions upon the quantity of carbon monoxide contained in gas supplied within the United Kingdom. As this is a coal-gas company pure and simple, it is not directly affected by this decision; but it shares any indirect advantage which may be derived from the popularizing of gaseous fuel by such undertakings as may use water gas in order to cheapen their cost of production.

The returns from bye-products are considerably less favourable than in 1920. This is especially the case with chemicals. Owing to the absence of effective legislation, the country became overstocked with imported dyestuffs; and this, together with the slump in the textile trades, seriously affected the chemical industries.

The co-partnership has come triumphantly through a very difficult period; and it has to be placed on record that during the very disturbed labour conditions existing in the early part of the year, the loyalty and devotion of the employees were never for a moment in question. It is unfortunate that they, like the shareholders, have to suffer from the effects of the coal stoppage; for the proposal not to pay any increment of dividend equally precludes them from receiving any increment on wages.

Two Directors (Mr. John Mews, LL.D., and Mr. Arthur Matthews Paddon, M.Inst.C.E) and one Auditor (Mr. Charles

Pelham Crookenden, F.C.A.) retire by rotation. They are eligible and offer themselves for re-election. Mr. Philip Richbell has been elected an Employees' Director in place of Mr. James Waterer, retired.

CHARLES CARPENTER, President.

Offices: 709, *Old Kent Road, S.E.* 15,
Jan. 25, 1922.

The Accounts.

The following are the principal portions of the accounts accompanying the report.

The first two statements relate to the stock and loan capital. The former states that the ordinary capital issued prior to 1916 under the Company's various Acts, on which dividend is payable, is £6,609,895; and there has been issued under the 1916 Act £250,000 of 5 p.ct. redeemable preference stock. The loan capital account shows that the loan capital, the rate of interest on which is 3 p.ct., amounts to £1,895,445; and the redeemable 6½ p.ct. loan capital to £734,000.

The third statement is the capital account, which stands at £9,467,320. The items of expenditure are as follows:

Capital account to Dec. 31, 1920.			£8,670,349 17 4
Expenditure during year to Dec. 31, 1921—viz.:			
Buildings, plant, and machinery	£13,866 8 7		
Mains and services	8,371 4 6		
Meters	8,435 11 8		
Stoves	6,683 1 0		
		37,356 5 9	
Total expenditure			£8,707,706 3 1
Balance			759,613 16 11
Total			£9,467,320 0 0

The net revenue account shows a balance of £172,079 applicable to dividends. The balances of the reserve, renewal, and special purposes funds stood as follows on Dec. 31 last: Reserve fund, £143,390; renewal fund, £44,114; special purposes fund, £95,303.

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the year as follows: Coal, £332,580; coke and breeze, £17,852; tar, ammonia, and products, £192,357; and sundry plant and stores, £345,573. The figures this time last year were: Coal, £434,813; coke and breeze, £75,954; tar, ammonia, and products, £255,640; and sundry plant and stores, £467,775. A sum of £84,321, co-partnership bonuses and savings, has been deposited with the Company; and the total of the superannuation and guarantee funds is £280,925.

The following is the revenue account:

EXPENDITURE.

Manufacture of gas—			
Coal into store, including £8714 17s. for London Port and tonnage dues	£2,554,188 12 5		
Purification	36,246 18 3		
Salaries of Engineer and Officers at works	99,279 9 11		
Wages (carbonizing)	253,914 1 3		
Repairs and maintenance of works and plant, less £9277 13s. 9d. received for old materials	580,639 14 4		
		£3,549,268 16 2	
Co-partnership fund		..	
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes	£169,235 9 9		
Salaries and wages of officers, including rental clerks	121,897 16 8		
Repair and renewals of meters	185,172 3 8		
Repair and renewals of stoves	143,570 13 3		
Repair and renewals of gas-fittings	161,019 5 11		
		780,955 9 3	
Public lamps, labour and materials £84,321 18s. 11d., less £51,495 18s. 8d. received for the same		32,826 0 3	
Rents, rates, and taxes—			
Rents payable	£2,793 8 2		
Rates and taxes	180,624 16 0		
		183,418 4 2	
Management—			
Directors' allowance	£5,046 5 10		
Salaries of Management Staff	24,643 12 5		
Collectors { Ordinary	21,497 2 3		
Collectors { Slot meter	82,826 13 9		
Stationery and printing	24,453 19 1		
General charges	47,534 12 9		
Company's Auditors	225 0 0		
		206,227 6 1	
Miscellaneous—			
Law charges		1,980 17 7	
Parliamentary charges		1,351 14 5	
Bad debts		2,312 13 7	
Stolen from 441 slot meters broken open		261 2 10	
Superannuation, sick, and accident funds		42,611 4 9	
National Insurance Act charges		21,983 12 5	
Gas Referees and Official Auditor		2,249 0 11	
Leasehold renewal fund		2,020 0 0	
Total expenditure		£4,827,446 2 5	
Balance carried to net revenue account		440,622 9 7	
		£5,268,068 12 0	

RECEIPTS.

Sale of gas—			
Midsummer, at 10½d. per therm	£1,667,375 0 0		
Christmas, at 11½d. per therm	1,699,703 4 6		
	£3,367,078 5 3		
Public lighting	63,294 13 10		
		£3,430,372 19 1	
Meters at rent	£118,002 0 0		
Stoves and fires at rent	92,822 6 1		
Gas-fittings at rent	139,292 18 2		
		350,117 4 3	
Residual products—			
Coke	£1,128,043 7 3		
Breeze	29,845 18 2		
Tar and tar products	232,513 2 6		
Ammonia and products	92,847 3 10		
		1,483,249 11 9	
Rents receivable		4,107 6 11	
Transfer fees		221 10 0	
Total receipts		£5,268,068 12 0	

Total amount paid in salaries or year, £247,140 13s. 3d.
" " " wages " £1,735,842 14s. 9d.

Statement of Coal.

In Store Dec. 31, 1920.	Received during the Year.	Carbonized during the Year.	Used during the Year.	In Store Dec. 31, 1921.
Tons. 207,276	Tons. 1,177,175	Tons. 1,197,975	Tons. 2519	Tons. 183,957

Statement of Bye-Products.

Description.	In Store Dec. 31, 1920.	Made during the Year.	Used during the Year.	Sold during the Year.	In Store Dec. 31, 1921.
Coke—tons	75,527	734,529	141,966	651,273	16,817
Breeze—tons	806	140,445	83,251	56,329	1,671
Tar—gallons	616,931	10,937,647	11,016,098	8,645	529,835
Ammoniacal liquor—butts	11,777	421,034	421,951	..	10,860

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Therms. 83,828,000*	Therms. 1,520,656	Therms. 77,030,458	Therms. 79,789,961	24,497

* Includes 79 313 therms received from H.M. Fuel Research Station.

BRITISH COMMERCIAL GAS ASSOCIATION.

Report of the Executive Committee.

The following report of the Executive Committee was presented to the General Committee of the British Commercial Gas Association on Tuesday, Jan. 31.

FINANCE—SUBSCRIPTIONS.

The Executive have pleasure in reporting that the number of undertakings who are now subscribing on the joint basis has reached the figure of 579, which is an increase of 59 since the last report. These 579 undertakings represent, reckoned on a basis of output, 69·3 p.ct. of the total industry; and of the 59 additional subscribers, 30 have not previously subscribed to the funds of the British Commercial Gas Association.

Steps are being taken to canvass further (1) those undertakings which were previously subscribers to the Association and have not yet agreed to contribute on the new basis; and (2) those undertakings which have never hitherto subscribed. Applications for payment of subscriptions in respect of 1921-2 have now been sent to all subscribers; and the replies received to date are very satisfactory. The Executive again urge upon all members the desirability of, and need for, early payment of subscriptions.

A meeting of the Joint Finance Committee, representing the National Gas Council, the Institution of Gas Engineers, and this Association, was held on Dec. 13, at which the President of the National Gas Council submitted estimates showing that the joint income for the current financial year would, having regard to the general decrease in output and to the increase in expenditure, fall to a figure which would leave a deficit on the accounts of the National Gas Council. The President also pointed out that estimates of the Institution of Gas Engineers in respect of their Special Purposes Fund (out of which their research work is financed) showed a deficit of £2000, after allowing for a special contribution of £1500 from the Publicity Fund of the National Gas Council.

The Chairman of the Executive, who was supported by Mr. Clarry (Cardiff), explained to the Joint Finance Committee the great need for a continuance of, it not an increase in, the work of the Association, particularly having regard to the increased competition with which the industry was confronted and threatened, but informed them that, in face of the undoubted needs of the National Gas Council and the Institution of Gas Engineers in the current year, he was prepared to submit to the Executive Committee for their consideration, and, if approved, their recommendation to the General Committee, a suggestion that the British Commercial Gas Association should contribute £2000 to meet the deficit in the Special Purposes Fund of the Institution of Gas Engineers.

The Executive, who fully considered this matter at their meeting on Dec. 13, now recommend to the General Committee that out of the Association's balance brought forward the sum of £2000 should be paid to the Institution of Gas Engineers as and when cash is available for that purpose.

ALTERATION IN DATE OF CLOSING FINANCIAL YEAR.

In order that the accounts of the Association may in future coincide in period with those of the National Gas Council, the Executive recommend that, commencing with the current year, the date for the closing of the accounts be altered from Aug. 31 to March 31.

DISTRICT CONFERENCES.

The Manager of the Association has attended meetings of

several of the District Institutions, and arrangements have been made to hold District Conferences as follows:

District.	Town.	Date.
Manchester (Lancashire Section) . .	Blackburn	March 22
,, (Yorkshire Section) . .	Bradford	To be arranged
Midlands	Coventry	,, ,,
Southern	Southampton	March 7
Wales	Cardiff	To be arranged

Negotiations are in progress regarding District Conferences in Scotland and Ireland, also the Northern and Eastern Districts.

ELEVENTH ANNUAL MEETING AND CONFERENCE.

BRISTOL, OCTOBER, 1922.

After consultation with the President, the Executive recommend that the date of the Eleventh Annual Meeting and Conference be fixed for Oct. 2, 3, and 4.

CHILDREN'S FAIRY GAS COMPETITION.

This year's Children's Competition has broken all records with regard to (*a*) the number of competition forms circulated; (*b*) the number of gas undertakings who have taken-up the competition; (*c*) the number of gas undertakings who are awarding local, as distinct from the national, prizes; and (*d*) the number of Education Authorities and schools who have given the competition official recognition.

Just over 100,000 competition forms have been distributed; and even if no more than 50 p.ct. of these forms are actually sent in by competitors, the task of judging the competition will prove a colossal one. Members have, therefore, been invited to assist with the preliminary judging of the forms, and already many promises of help have been received. The increasing amount of widespread interest that is taken in the Children's Competition promoted by the Association from year to year is excellent testimony to the value of such publicity; and the Executive take this opportunity of again urging upon all members the value of co-operation in these competitions, both from the individual and national points of view.

POSTER COMPETITION.

Nearly 400 designs were submitted in connection with the Association's Poster Competition; but, unfortunately, in the opinion of the judges no design was received suitable for reproduction as a poster of sufficient merit to justify the award of the prize of £100. The Executive have therefore extended the competition for a further two months (closing date March 31), as they feel that in the early period the competition was not sufficiently well advertised as to bring it to the notice of the poster artists. The competition is being advertised in the papers circulating among artists; and it is hoped that a higher standard of work will be submitted in the further competition.

Of the designs submitted in the preliminary competition, thirteen have been purchased by the Association under rule 4 of the competition at £10 each, for use as showcards, illustrations for advertisements and booklets, &c.

GAS-FIRES IN HOTEL BEDROOMS.

The Association's campaign for developing the use of gas-fires in hotel bedrooms, &c., has been well received in the industry, and questionnaire forms (as per sample enclosed with the circular) are coming in daily from all parts of the country. The information given on the forms demonstrates very clearly the enormous field for increased business in this particular sphere; and arrangements are in hand for pushing forward with the campaign as soon as possible. It will facilitate the work if undertakings who have not yet returned the questionnaire forms will do so at once.

TEACHERS' NOTES FOR LESSONS.

A specimen copy of the bound volume of Teachers' Notes for Lessons has been sent to all members of the Association, as well as a selected list of non-subscribing undertakings. Both the book and the suggestions for its distribution have been taken-up by gas managers; and orders for additional copies have been received daily since the specimens were issued. While it is too early to give any figure respecting orders which are coming in daily, the Executive take this opportunity of emphasizing the value of, and the need for, each member giving his active and practical support to this and other forms of educative publicity if the most fruitful results are to be obtained.

INTERNATIONAL MEMBERS.

The following candidates are recommended for election as International Members:

Monsieur G. Lamy . . .	France . . .	(Lyon)
,, T. Eguchi . .	Japan	(Tokio)
Mr. C. L. Philips . . .	Holland . . .	(Nymegen)
,, Andrew F. Meijer. .	,, . . .	(Dordrecht)

NATIONAL BABY WEEK.

National Baby Week is to be held this year during the first week in July; and the Editor will be pleased to hear from members who desire to co-operate in this movement.

(Signed) F. W. GOODENOUGH,
Chairman.

THE FULL UTILIZATION OF BITUMINOUS COALS.

THIRD ARTICLE.*

The Low-Temperature Carbonization of Coal. Its Possible Technical and Commercial Solution and the Lines along which same could be Attained with the Prospects.

[COMMUNICATED.]

THE technical application of this system still remains in its infancy, and Mr. Joseph D. Davis, of the United States Bureau of Mines, ascribes this slow development to three causes—inadequate knowledge of coal composition and thermal decomposition, the slow evolution of suitable retorting apparatus, and the non-existence of a market for the rather special distillation products of low-temperature carbonization.

In the writer's opinion, the importance of the second reason assigned for slow development has been overlooked. The first, or primary, factor in the progress of a distillation system is inevitably the design of plant and process. We know only too little of the inner constitution of coal; but this has now, the writer argues, been sufficiently thrashed-out to enable the general principles of both plant and process to conform to such discoveries, and full use to be made thereof. Naturally the third reason assigned covers factors entirely relative to the design of plant and process. It is true that low-temperature products have not as yet found a ready market; but it cannot be said that any adequate supply has been created to test the demands that may arise. Further, several of the products can be so varied according to the process that generalization here is dangerous; and it is also evident that products having a high present demand could be isolated by appropriate process control.

"Authorities also differ as to the meaning of 'low temperature' in this direction. While Bone recommends 550° to 600° C. as best suited to British bituminous coal (temperatures used also by the Fuel Research Board), and while Fischer and Gluud (Institut für Kohlenforschung) consider this range preferable for the production of primary tar (*urteer*)—the latter state that the primary tar only begins to decompose appreciably at 800° C.—and S. W. Parr, converting Illinois coal into a smokeless domestic fuel, defined low-temperature carbonization as destructive distillation at temperatures not exceeding 750° or 800° C., Mr. Davis would not exceed temperatures of 750° C., so as not to decompose the paraffins and tar acids. There is considerable diversity of opinion, further, as to the character and amounts of the bye-products attainable. But bituminous coal may be said to yield about 10 p.ct. of primary tar oils, consisting chiefly of phenols (up to 50 p.ct. of the tar), hydrocarbons of the paraffin series (10 p.ct. to 15 p.ct.); and of naphthenes, hydro-aromatic and unsaturated compounds, 15 p.ct. may be classed as lubricating oils boiling above 300° C., and 9 p.ct. as resins. As to these figures, Gluud and Parr are in fair agreement. The coked residue will represent 70 p.ct. to 75 p.ct. of the coal, and will still contain up to 18 p.ct. of volatile matter. Like Fischer, Parr recommends a preliminary slow heating-up to 300° or 400°. The ton of coal should yield some 5000 or 6000 c.ft. of a gas of 650 B.Th.U. to 570 B.Th.U., of which 27 p.ct. will be hydrogen and 58 p.ct. methane and higher members, 7·5 p.ct. of CO, and 2·5 p.ct. of CO_2." ("Engineering," Jan. 6, 1922, p. 31.)

The limitation of the temperature of treatment is essential so as to prevent extensive secondary decomposition, and 750° C. approximately seems an average upper limit for most coals. The limit would, in the writer's opinion, vary with the coal according to its cellulosic, resin, and protein blend; being lowered by the preponderance of cellulosic and proteid groups over resinic, and particularly if the cellulosic group contains a large proportion of unaltered humus.

The range of temperatures lies between 550 to 800° C.; all coals being amenable to efficient treatment within such ambits. There definitely seems a critical stage from 700 to 800° C., when great care has to be exercised in heating so as to prevent exposure of the distillate to these or higher temperatures, which results in the primary tars and oils being cracked.

This temperature limitation is therefore a characteristic limitation of the low-temperature system of carbonization—and, on lines of external heating solely, cannot be embodied without considerable disadvantage, in causing a slower rate of heat transmission both to and through the charge as compared with high-temperature processes. This failure—inherent to some extent in the nature of the problem—of plant hitherto proposed to realize a high throughput per ton of carbonizing weight is, in the writer's opinion, the crucial factor hitherto preventing the commercial success of low-temperature schemes. It can, as will hereafter be demonstrated, be ingeniously but simply overcome by combined external and internal heating, and in a manner enhancing, rather than detracting from, the heating and technical efficiency of the process.

"Respecting the yields from the process, the fuel oils are undoubtedly and admittedly valuable. The 3 gallons of motor spirit which the ton of coal may yield require refining of the tar oils, however; but a light oil, complying with the Admiralty specification, can be produced by distillation (*in toto* or in part) with

* The first and second articles appeared in the "JOURNAL" for Dec. 7 last (p. 686) and Jan. 4 (p. 28) respectively.

steam." (The Barnsley plant has proved this.) Tar acids are wanted for timber preservation. "According to F. P. Collins, the United States required nearly 100,000,000 gallons of such oils before the war, two-thirds of which was imported. The low-temperature oils seem better suited for this purpose than the ordinary creosote oils of gas-works. The acid oils are also used as insecticides and disinfectants, and for ore flotation. The amount of surplus gas available for distribution is small; but the gas is of good quality and suitable for domestic heating. As regards the kinds of coal that can profitably be submitted to low-temperature carbonization, semi-coking coals rank first. Sub-bituminous coal and lignite also lend themselves to this treatment, and these are receiving attention in the Western States of America, where high-grade solid coal is scarce, and in Canada." ("Engineering," Jan. 6, 1922.)

The production of a smokeless domestic fuel of a semi coal or coalite nature has always been a primary object, and rightly so, if the proper material could be produced. It has been usual to discharge the residue with 6 to 12 p.ct. of volatile matter; but this, in the writer's opinion, errs on the wrong side—10 to 15 p.ct. are much superior limits, since a carbonized residue containing such quantities is smokeless, and by proper retorting such a residue can be isolated in a hard, dense, porous state. It would, however, require that the volatile of the original coal treated should never fall below 30 p.ct., as otherwise there is no margin for sufficient bye-product yields. The reasons for the writer's having raised the limits for the coalite include: (1) Smokelessness of these limits being equal to lower ones; (2) higher calorific power of the material; (3) saving of heat duty in retorting, such last remnants of cellulosic, proteid, and resin groups being hardest to distil at a low heat; (4) facility for forming a transportable material equal to that of a less volatile coalite by control and variation of the retorting factors.

The advantages of such a procedure will be best realized by contrasting them with the defects of previously produced coalites—viz., non-ignitability, breakability, as also the difficulty of creating a market under such disadvantages. But remove these latter, and the creation of a market for coalites produced from coals of excessive volatile matter for the other processes should find a ready and welcome competitive place.

With these two main considerations clear, let us now consider what is involved in low-temperature retorting, and how best the desired results can be accomplished.

Considerations Relating to Best Materials for Treatment.

As the raw materials best amenable to low-temperature treatment from the point of view of the maximum of yields of oils and tars—the determining product factors—comprise the high volatile coals of semi-caking varieties, and the cannels and lignites, it will be realized that the composition blend is usually abnormal or extreme along the cellulosic and proteid groups. Mixing of very caking and non-caking blends to realize a balanced low-caking composition is desirable; the point of balance determining the caking quality in low-temperature carbonization being preponderant in cellulosic and proteid more than is the case with high-temperature work and wherein less total (and particularly of the higher resins) resin is demanded. It is, however, necessary to qualify by the statement that careful retorting must be performed to deal with the intumescence and reconsolidation into semi-coke, the main key to which is the provision of a ready outlet, the path along which decreases in temperature so as to conserve the distilled products. Suction is almost invariably desirable, if not necessary, for this double assurance.

Usually it has been found that up to 70 p.ct. of a non-caking coal or slack can be admixed with the caking variety; but this is a matter of variation from place to place according to variations in the qualities of the two or more ingredient coals admixed. The caking quality of coals according to low-temperature carbonization also depends upon lower melting, or more easily decomposed, resins than those of coking value in high-temperature practice. The resins of medium temperature decomposition—550° to 750° C.—are most valuable; those below are troublesome in intumescence, and those above largely unaffected by the treatment.

Below 600° C. it is a real task to carbonize the best low-temperature coals with recovery of full oil and tar yields, and also to produce a hard, compact, dense transportable semi-coke, or smokeless coal, as residue. The presence of a certain definite quantity of 550° to 750° C. composition resins, with preferably absence of excess of those classes melting below such temperatures, seems to be a paramount factor in the formation of the desired residual solid fuel, so much so that, in removing the temperature below 650° C., failure in this respect is immediately courted.

The requirements of medium temperature resins increase as the heating temperature is lowered; but so does the difficulty in dealing with the process of intumescence, which is more expansive with large resin contents than otherwise. As also prohibiting outlet for the low-temperature distillates from being as ready as otherwise would obtain, expansive intumescence is still more accentuated by the lowest melting resins being in excess. For these reasons, the advantage of admixing non-caking coals with caking varieties for treatment is often as much negative in defeating the expansion of intumescence as positive in promoting a compact residual solid fuel in assuring proper resin fusion, decomposition, cementation, and hardening.

As the heating temperature is allowed to approach 800° C., the higher resins come more into play, and their presence becomes an influencing factor in the coals best amenable to treatment, which are those of high cellulosic character but containing moderate resin. The rules for high-temperature practice will then become approached in respect to the quantity of resin required and the use made thereof. It will be observed, therefore, that in low-temperature practice two irreconcilables have to be compromised—the bye-product yields tend to lower the temperature, and production of the best solid product to raise it. In the one-stage process, evidently a difficulty of almost insurmountable character ensues. What is there to do but to compromise, and carbonize with a heating temperature that will neither excessively spoil the oil and tar yields nor invalidate the compactness or solidity of the coalite produced, and thus to operate at 650° to 750° C., according to the coal treated?

There are clearly, then, but two paths for proper working and treatment—either to select and mix the coal to be treated so that it is adapted to the temperature and mode of heating in the realization of the optimum of tar oils, &c., and the hardest semi-coke, or to take each coal, or mixture of coals, in stages, and adapt the process to step by step, or zoning, practice, wherein each objective is separately effected under the best conditions appropriate thereto. In lowering the heating temperature below 600° C., and therefore the melting points of the resins available for decomposition—*i.e.*, fusion and hardening—and thereby having to increase their amount, it is imperative more than proportionately to increase the suction, compared with that required with higher temperatures and equal resin contents. On lowering the temperature too far below 500° to 550° C., the resin of value remains undecomposed or semi-decomposed, and only permeates the mass, rendering it sticky, soft, and fragile, and serving but to swell and choke the retort.

The one-stage process, in so far as it must combine in a compromise two irreconcilables, tends inevitably towards loss of throughput—a difficulty experienced with most low-temperature processes advanced. When heating is restricted to the external method, this difficulty is most pronounced. When internal heating is incorporated in the manner heretofore proposed, the greatest care is necessary to safeguard the retort from the dangers of intumescence—choking and sticking.

Difficulties of Low-Temperature Intumescence and Formation of Hard, Compact, Solid Residue.

The stage of intumescence before reconsolidation into semi-coke can ensue, is a delicate one in low-temperature work. As a result of the slower heating realized by most systems yet advanced, such intumescence is accentuated and prolonged, occupying, in intermittent operations, fully 75 to 85 p.ct. of the coking time. On the other hand, the formation of hard semi-coke has therefore to be restricted to 25 to 15 p.ct. of the coking time—evidently a most difficult task. To eradicate such defects inherent in the methods of intermittent treatment is no easy task. The difficulty is the greater because of the residual volatile in the coal, which, unless the coal is properly blended, remains in a semi-plastic condition, in which case carbonization may have to proceed to a greater extent, but with the danger of non-ignitability. The question of two extremes—viz., slow processing and rapid processing (*i.e.*, heating)—for the isolation of the optimum of yields of liquid and gaseous products and the hardest solid residue respectively, therefore constitutes a paradox for attainment or solution when using either an intermittent or a one-stage process with external heating.

Intumescence takes place at 350° to 400° C., depending on the nature of the coal; the binding materials in the coal fusing and cementing the mass. Accompanying such intumescence, especially when effected under a prolonged small and low-temperature gradient for heating purposes, resulting in very poor conductivity of heat to and through the charge, there results exaggerated expansion of an excessive or abnormal degree, as the resins liberated only serve to percolate through and to swell and choke the whole mass. It is therefore essential to combine two apparently opposing forces—(*a*) rapid low heating, and (*b*) conservation of the bye-products before this problem can be effectively solved without injury to the kind of solid residue isolated. Evidently the low-temperature problem contains its key in the equilibration of opposing factors—those demanding conservation of the distillate and those demanding high-temperature procedures in order to produce a passable semi-coke and a commercial throughput. Naturally a synthetic system, both in process and plant design, is the only true and full solution.

The above fundamental considerations, the required divergent speeds of the intumescent and reconsolidating processes in low-temperature as compared with high-temperature carbonization, and the desired increase in the rate of heating, together with the necessity for assuring that the distillate is given a free cool outlet, have only been realized as the result of the considerable experimental work done; whereas it could have been reasoned-out provided a full knowledge of the constitution of coal was immediately available. Up to quite recently, it could hardly be accepted that this was sufficiently true; but the writer contends that at the moment this is sufficiently understood to warrant proper systematic retorting on lines laid down in accordance with such knowledge. He, however, wishes clearly to admit the value of such varied experiments as have been conducted in furnishing further and supplementing knowledge already obtained in the laboratory. But if the laboratory method is pursued to its limits for yielding

information, it will greatly assist in preventing many unnecessary (and therefore really of purely negative value) experiments by way of check, while allowing better determination of those of a constructive character.

Most of the failures of low-temperature schemes can be traced to this lack of understanding of essentials in respect to the inherent obstacles in the particular nature of the problem and its issues affecting (*a*) the nature of the raw material and its behaviour under low-temperature conditions, and (*b*) the adaption of process and plant to answer such difficulties. The difficulties in both factors have further been aggravated by the conservatism of method, which has generally insisted upon attempting solution along the orthodox lines of external heating, or by adding only a modicum of internal heating. The design of plant to meet the diverse requirements of the twin objectives of the usual low-temperature process has also hitherto presented a hard case to mechanical ingenuity for solution, undoubtedly owing to the fact of the little knowledge on the composition and heat behaviour of coal possessed by the mechanical designer; and naturally, therefore, a smooth organic process and plant are not readily produced without such considerations receiving full and satisfactory embodiment. This has been well demonstrated by the suggestion of separating the two aspects by briquetting after carbonization. But this has the disadvantage of doubling operating costs and demanding as a *sine quâ non* cheap raw fuel like slack.

Lines of Solution of the Problem.

Heating.—This should be in accordance with both external and internal methods, and each should be developed to the limit consistent with not cracking the liquid products affected above 700° to 800° C. It is possible simply and efficiently to allow combustion to proceed under damped conditions, transferring heat generated by combustion in flues external to the retort to the heating media used for infiltration through the charge, thus obtaining a reduced temperature incidence—not more than 800° C., say—without undue reduction of the heating efficiency or conductivity, and economically obtaining large throughputs. By presenting the heat on one side of a charge and passing the heat therethrough transversely, simultaneously withdrawing the distillate under suction, it is possible to effect any desired temperature drop across the charge thickness by variation of such thickness and by temperature and heating control at the flues.

By placing zones of heating flues along the height (or length) of the retort and operating each stage or zone under separate heating conditions, it is readily possible to treat the travelling charge in steps, and thereby effectively realize the possibilities of each phase of the process by establishing the appropriate conditions therefor per stage. In fact, the potentialities of fuel distillation inherently demand staging or zoning the retort for liquid, gaseous, and solid products. Succession is the order or law of distillation of a complex fuel like coal. Such successive treatments permit of intensification to the limit; whereas a one-stage process demands balancing to a nicety of a host of composite demands and conditions. In order to realize different periods or the equivalent effect per stage, it is only necessary to make the stages of different dimensions, or to repeat the same conditions in two or more, or to intensify the functions of some compared with the others.

The above principles are completely embodied in the Everard-Davies system of low-temperature carbonization, the heating provisions of which, appropriately operated, can effect a heat transmission at a low temperature—600° to 800° C.—equal to, and greater than, that of the present high-temperature practices—viz., 1 in. per hour penetration of the carbonizing temperature through the charge. This transfusion of conductive heat into a convective heating medium—lowering the temperature but increasing the volume of heat—defeats the transmission limitation of externally transmitting only one quarter of the heat when halving the temperature of 1000° C., and so prolonging carbonization.

The use of highly conductive refractories is a matter of greater advantage to low than to high temperature work, but has not been seriously attempted. The principle of one side heating is a security in the conservation of the distillate, as exposure is thereby obviated, and also heating is rendered more efficient by the fuller thermal absorption that thereby ensues. In operating a continuous vertical having three or more stages of heating flues along its height, the temperature drop of each stage will naturally diminish from top to bottom as the descending charge is heated-up; but a minimum drop of 300° C. for the last stage can thus be secured. It is, of course, permissible to increase the temperature at the heating walls of the lower stages above 800° C. in order rapidly to effect coke hardening; but the passage of the coal through the retort should be adjusted so as to retain the necessary volatile for ignitability without carrying oil-yielding volatile into the lower stages.

Operating on these lines, it will be seen that the low-temperature process of carbonization can be systematically sorted out, and the natural phases each given every propensity for full expression—*e.g.*, the various oils can be isolated in maximum quantities, which can be increased in fact beyond the normal amounts of the externally-heated closed retort yield by reason of the upbuilding with steam and hydrogen under the best conditions, the gas can be recovered in greater quantity and of rich quality because of the increased thermal efficiency of the heating arrangements, and the absence of diluting factors in excess; and a coalite of hard, compact structure—or a high-temperature coke, should high-temperature carbonization be resorted to in the later stages—can be assured by the rapid and greater heating effected in the bottom zones of the retort. The conservation of the distillate in its enriched primary state would, in fact, invariably be adopted even in the high-temperature carbonizing practice for gas manufacture, when using the Everard-Davies vertical retorts. The internal and external heating would in this case, however, be purposely intensified so as to crack-up some of the oils and tars into rich gases; but these latter would be preciously conserved so as to admit of greater limits in steaming below in the water-gas zones to permit of making greater gas yields per ton of coal treated.

In this sense alone, apart altogether as to whether a coalite is isolated as the solid product, low and medium temperature carbonizations have a great service to render to the gas industry. The production of smokeless fuel or coalite is, however, a most desirable realization in the amelioration of atmospheric conditions in the large towns and cities, and its attainment would involve a great saving to the national resources. The technical problem therein being solved with an economic margin to warrant all coal (from 30 p.ct. volatile matter) being thus treated should enable the industry to treat much of the nation's coal for the two purposes of (*a*) gas, and (*b*) domestic fuel manufacture. Of this, however, more again. Incidentally, the two processes work hand-in-hand if properly blended, and would permit of the gas industry developing four main products—viz., gas of 400 to 550 B.Th.U. per cubic foot for all purposes for which gas can serve, (*b*) gas coke, (*c*) domestic solid fuel of a smokeless kind, and (*g*) bye-products. But in order to permit of such an accomplishment, the present low-temperature carbonization limitations and failings have to be overcome and its achievements absorbed into the high-temperature system in order to enhance them.

The importance and bearings of low-temperature work will, in the writer's opinion, be of far greater result indirectly by incorporation into existing industries, collieries, gas-works, power stations, &c., than they can possibly hope to be outside in independent competition. In fact, the writer holds out very little hope on these latter lines, as the oil yield of itself is not sufficient an attraction to warrant building-up a great new industry in times when permanent values hardly exist. As the oil yield cannot be realized without isolation of the gas for which a market must be obtained to render the process commercially possible, the existing gas organization forms a most valuable avenue. Incidentally, the great need for maintaining the calorific value above 425 and even 480, while increasing the efficiency of the gas-producing apparatus in gas manufacture, because of the great cost of distributing lower values, can also be satisfied by such combined low and high temperature carbonization.

With reference to the Everard-Davies system of zoned verticals, wherein low-temperature carbonization occurs at the top and high below (with, if desired, medium between or below according as to whether coke or domestic smokeless fuel is required as the residue), there are many novelties for enhancing the liquid and gaseous results otherwise obtained but which are accessory to the main elements; and description of these is withheld for the present until the making clear of the first essentials has been completed.

The Optimum of Liquid Products and Conditions Obtaining Therefor.

A little may, however, be said under this heading. It has been amply demonstrated that the steaming of coal or the like carbonaceous material (such as shale) undergoing carbonization at 500° to 800° C. is productive of high liquid hydrocarbon yields, and at 700° to 950° C. of high, rich gas yields. But very little has yet been done to investigate thoroughly the possibilities of such uses of steam, as the retorts upon which such processes have hitherto operated have been tied within narrow ranges.

Throughput.

In the twin retorts characteristic of the Everard-Davies system, charges of varying thickness from 12 in. to 36 in. can be made up from 10 to 30 or more tons, which, with a period of eight to twelve hours per carbonizing weight of charge, would realize 20 to 90 tons per day per setting. A retorting plant to deal with 300 tons per day could certainly be given at a price no greater than the present-day rates of high-temperature plant for the same throughput, and probably for much less.

Southern Association of Gas Engineers and Managers.—We learn from the Hon. Secretary (Mr. W. H. Bennett, of Redhill) that the next general meeting of the Association will be held in the Connaught Rooms, Great Queen Street, Kingsway, W.C., on Thursday, March 23, at 2.45. The members will lunch together at 1 o'clock.

German Gas Coal Difficulties.—According to an article in "Das Gas- und Wasserfach," the price paid to-day for coal by the Königsberg Gas-Works is thirty times the pre-war cost. In those days, they were fortunate in being particularly well situated for receiving English gas coal. At present they are having to use Westphalian coal, and about one-third of the cost is in freight by inland waterways from the Ruhr to Emden, and thence by sea to Pillau-Königsberg. As a result of improved working, and in spite of the smaller make per ton possible with the Westphalian coal, the charge for gas has only been raised to seven times the pre-war price.

TAR DISTILLATION.

At a Meeting of the Newcastle Section of the Society of Chemical Industry, last Wednesday week, Mr. E. V. CHAMBERS, of Lightcliffe (Yorks.), read a paper on "Tar Distillation." Dr. J. Paterson was in the chair.

Mr. Chambers described the process of tar distillation of some few years ago as somewhat unsatisfactory, in that it was too centralized and confined to a small number of works; and he detailed many of the well-known economic results of the time. During recent years however, he said, the operation of tar distillation had been greatly popularized, which was chiefly due to (1) the demand for prepared tar for road making, (2) the demand during the war for refined products from tar, and (3) the development of new types of tar distillation plant. The first two were largely responsible for the third. Tracing the development of the tar producing industry, he ascribed it to the growing use of tar by local authorities in charge of roads. Then, again, during the war it was speedily realized that large quantities of benzole would be required for synthetic phenol for conversion into picric acid and toluole for the manufacture of tri-nitro-toluene. The introduction of improved methods had been so great that to-day more than half of the total production of tar was distilled by the producer. Having thus been brought into direct touch with the market for distilled tar and light oils, and with the confidence gained by that knowledge, many tar producers extended their plants for the complete distillation of tar, for the production of crude naphtha, light oil, creosote, anthracene oil, crude naphtha, and anthracene. Thus there had been a considerably enhanced net return for crude tar, and saving in carriage, tank wagons, labour, and other charges. He followed his introduction by an exhaustive description of the various distillation plants in use, and illustrated his remarks by lantern slides.

Perhaps the most important, he said, was the tar produced at gas-works; there being an annual production of a million tons. In that section, three different types were produced: Horizontal retort tar, vertical retort tar, and water-gas tar. The following figures were given as average distillation from a number of gas-works tars (all figures percentages):

—	Horizontal Retort.	Vertical Retort.	Water Gas.
Specific gravity	1·195	1·110	1·080
Water	6·0	2·3	2·8
Oil to 170° C.	6·5	5·3	3·6
Oil 170° to 230° C.	9·5	20·1	12·0
Oil 230° C. to pitch	18·2	20·0	45·4
Pitch	59·8	52·3	36 2

It was observed that tar from horizontal retorts contained less oils than from vertical retorts or water-gas tar. Vertical retort tar was richest in light oils, and water-gas tar contained a large proportion of heavy oils with a low proportion of pitch.

Dealing with coke-oven tar, Mr. Chambers said that coke-oven bye-product recovery plants produced approximately 600,000 tons of tar per annum. Coke-oven tar varied considerably in quality, and generally contained considerable quantities of free carbon. His figures for an average distillation result of several samples of coke-oven tar were as follows:

	In Parts P.Ct.
Water	3·0
Light oil	2·5
Middle oil	5·0
Creosote oil	16·0
Anthracene oil	15·0
Free carbon	10·0
Pitch	48·5

There were, however, individual instances where the pitch content was as high as 60 p.ct.; and, naturally, the quality of the tar depended on the special conditions under which it was produced.

Speaking of the Mond producer gas tar, he said considerable quantities were produced in Great Britain, usually of a highly viscous substance at ordinary temperatures. It contained a large proportion of water, generally in an emulsified condition; and the water did not readily separate by gravity. A typical result from Mond gas tar was:

Water	16·8
Oils to 170° C.	3·9
Oils 170° C. to 250° C.	2·0
Oils 230° C. to pitch	22·9
Pitch	54·4

There was an entire absence of naphthalene.

The tar produced by the low-temperature carbonization process differed considerably from ordinary gas or coke-oven tar. It contained less of the aromatic hydrocarbons, and more of the paraffin series. He gave the following results from low-temperature carbonization:

—	Low-Temperature Tar from Cannel Coal.	Low-Temperature Tar from Bituminous Coal.
Water	2·3	9·5
Oils 0° to 230° C.	32·6	38·2
Oils 230° C. to pitch	39·0	8·0
Pitch	26·1	44·3

Moderate quantities of wood tar were produced from the dry distillation of wood, and also at the producer plants using wood for making gas. A sample of wood tar gave the following result:

Water	52·8
Oil to 250° C.	12·6
Pitch	30·6

Speaking at some length on the process of tar distillation, Mr. Chambers said the quality of the tar to be distilled was often the deciding factor as to the type of plant to be used. It was, for instance, almost impossible to distil tar containing a high percentage of water in the ordinary pot still, and particularly when the water was more or less emulsified with the tar. Such tars were apt to "foam," as the water was first to come to boiling-point. Large quantities of average tar were, however, successfully dealt with by the pot still; and the still was capable, by careful attention, of giving very definite fractions, which was often an important factor in the selection of a plant. When converting crude tar into prepared tar for road spraying, &c., a continuous type of tar dehydration plant had many advantages, and was also useful in connection with a pot-still installation. By means of slides, the lecturer showed the several types of dehydration plants.

Dealing with the separation of water, he said that, while entrained water could be partly removed by ordinary settling, it was but partial, and could not go beyond the effect produced by natural gravity; and natural gravity would not separate tar and water emulsions. The effect of gravity could, however, be increased many thousandfold by means of special types of centrifugal machines. The remarks on the separation of water were illustrated by lantern slides of the "Alfa-Laval" centrifugal machine.

The process of tar distillation could, he thought, be regarded as an extension of the tar dehydration process. The intermittent or pot-still process had been worked for the past hundred years, during which improvements had been introduced, and some discarded and some retained. But in some parts of Great Britain horizontal stills were utilized; and in these cases it was thought that the system of circulation was less likely to produce foaming than in other designs. Nevertheless, the pot or vertical still remained the most largely adopted.

The next slides of the lecture described fully a standard type of still and a complete installation for the continuous distillation of tar. The installation was of the tube type; tubes passing through the length of the still. A further series showed a simplified still for which he claimed many advantages, as it contained neither heating tubes nor baffle plates inside, and was capable of taking-up the waste heat from the system. This plant consisted of three circular stills, three rectangular condensers, and one heat interchanger or pitch-cooler; and it could be heated by gas or coke. It produced crude naphtha, light oils, creosote, and anthracene oil. Such a plant, when dealing with a ton of crude tar per hour, gave the following figures: Pitch 1080 lbs. per hour. No. 1 still, 20 gallons of crude naphtha per hour; No. 2 still, 51 gallons of light oil and creosote per hour; No. 3 still, 30 gallons of anthracene oil per hour. It was claimed that the working temperatures were extremely low, and distillation took place at a low pressure, which assisted in maintaining the low temperature. The plant was generally known as the "Cascade" plant, with circular stills, made by Messrs. Chambers and Hammond, of Lightcliffe (Yorks.).

DISCUSSION.

Dr. W. B. DAVIDSON complimented the author upon his paper—especially upon the useful statistics which he had given them. He thought that the presence of water was an adventitious theory; and he suggested it would be better, when comparing characteristics of various kinds of tar, to show percentages of oils and pitch on a dry test. If this were not done, quite a wrong impression might be conveyed. The question of water content was one that should be dealt with by itself. It was remarkable to find such great differences in that respect between tars produced at different works from the same coal, the same system of retorts, and under similar carbonizing conditions. The matter was worth attention, as a high water content was a great nuisance to producer and distiller, besides depreciating the value of the tar. The author appeared to have embodied no reference to the well-known difference in free carbon content between horizontal retort and vertical retort tar.

Mr. F. J. COLMAN considered the "Cascade" arrangement was one of the best; but it appeared to deal with small quantities of tar per hour, and no costs were given for fuel and labour. So he could not compare it with other methods. Personally, he believed in the principle of distilling tars in their layers, so that no tar fog was possible. While he favoured generally a continual chemical process, he had not yet heard of a continuous tar plant that would compare in costs and efficiency with the intermittent process. He imagined that the fuel and labour costs would be about half the costs of labour alone on the continuous plants that had been in operation during the past few years. He believed that the "Cascade" dehydrator could be used successfully for other purposes than tar distilling.

Dr. G. WEYMAN remarked that, though continuous stills could never produce finely fractionated products, it did not seem to him to be a drawback in the case of primary distillation for creosote products. He favoured gas-firing as against breeze, or coke or coal burners.

Mr. S. A. WILKINSON said that, after a good deal of experience, he still felt the pot still would take a lot of beating, especially in regard to costs. The author had mentioned a fuel consumption of 100 lbs. per ton of tar. The speaker had known of pot stills distilling with less, and even continuous processes with less, than 100 lbs. He thought the principle of bottom heating good; and if they could harness the heat from vapours, they should have a very good plant. He pointed out at some length that the difference in various tars was

an important factor, as in some cases where identical conditions prevailed, apart from the quality of the tar, there was a great deal of trouble with some tars and practically no trouble with others.

Mr. H. T. PINNOCK (South Staffordshire Mond Gas Company) described a plant put down at their works by Mr. Chambers. The plant was dealing satisfactorily with some of the most filthy tar he had ever seen. Mr. Chambers had installed the plant when other makers were very reluctant to tackle the job.

Mr. CHAMBERS, replying, said he could not agree that continuous plants only dealt with small quantities, for many of them were dealing with very large quantities. Regarding the costs, there was a certain type of continuous plant dealing with 30 tons per day which could be worked by one man, so far as supervision was concerned. He quite agreed that one could not entirely run-down the pot still, as it had years of great experience and skill behind it, and was often worked by old concerns who knew the still in and out. His own experience was, however, that the continuous process caused less trouble than the pot still. They had found that bottom heating was good; and he would go so far as to sacrifice even 20 lbs. of fuel in order to be rid of the trouble which bottom heating eradicated.

OBSERVATIONS ON A PRODUCER-GAS PLANT.

In a paper containing a detailed series of observations on a producer-gas power plant, which has recently been presented to the Institution of Mechanical Engineers, Messrs. H. S. Denny, C.B.E., and N. V. S. Knibbs, B.Sc., remark that coal is one of the main bearer-stones in the structure of British industry; and to-day more than ever in the history of that industry there exists the need of a thorough and searching investigation in the economics of its production and use. The cash value of the British thermal unit is three times as great to-day as it was before the war; and wasteful, careless, or inefficient usage is no longer to be countenanced as a permissible evil. A stage has been reached where the incidence of fuel economy is so marked as to call automatically for the maximum efficiency in usage; and the latter must be secured if British industries are successfully to cope with foreign competition. It is therefore necessary to examine rigorously the fundamental features of all processes of coal usage, before accepting them as applicable to present-day requirements. Whether it be for domestic use in the household grate, or under the boiler for steam raising, or in the coke-oven or gas-producer, the call for investigation is acute; and it becomes the duty of every consumer, not only in his own but in the national interest, to see he is getting a fair and economical percentage of actual work done for every pound of coal he uses. In the past there has been great waste. The average efficiency has been so low that more than 90 p.ct. of the work done in mining, hauling, washing, transporting, and burning coal has been thrown away; and even to-day the average performance shows but little improvement. If it be allowed for a moment that the loss could be reduced to 80 p.ct., the potential value of the coal output, and, further, the coal reserves, would be at once doubled. In 1917-19, a large-capacity Mond gas-producer plant, coupled up to a gas-engine plant of equivalent size, came under the authors' control; and a unique opportunity for carrying out a special investigation thus being opened, it was decided to take advantage of it.

The gas-producer plant, which was erected in 1909, consists of seven Mond producers, of 10 ft. 6 in. diameter, each designed to gasify 24 tons of coal per day, and arranged in line with coal storage hoppers of about 700 tons total capacity above them. It adjoins a colliery which supplied all the coal used. The Mond equipment installed is of orthodox type, and includes an additional gas-cooling tower for the final cooling necessary before purification for gas-engine work. The steam-raising plant consists of seven Lancashire boilers, only four of which were used for the producer plant; but in addition all steam from the gas-engine exhaust boilers was consumed in gas generation. The water and liquor pumps and the blowers are all situated in one house and driven by steam-engines. The ammonium sulphate plant is a separate unit.

Coal was brought over from an adjoining colliery by a belt-conveyor, and after passing over a weigher was elevated to the storage-hoppers. The colliery undertook to supply coal to the following specification: "60,000 tons per annum of pit slack from the top hard seam of the colliery, passed through a 1½-in. and over ¼-in. square mesh, and as free from dust as is reasonably practicable." Grading analyses were carried out on weekly average samples of the coal; and these tests usually revealed the presence of a high percentage of fines through ¼-in. mesh.

An ultimate analysis on the dry coal furnished the following figures: Carbon, 70 p.ct.; hydrogen, 5·5 p.ct.; oxygen, 11 p.ct.; nitrogen, 1·5 p.ct.; sulphur, 1·0 p.ct.

The Mond system of gasification aims at a high recovery of the thermal value of the coal, and simultaneously a high percentage of the nitrogen of the coal in the form of ammonium sulphate. It is claimed that a low grade of coal may successfully be employed; the comparatively low temperature of the fuel bed ensuring an absence of clinker formation. A feature of the process is the heat exchange between the hot gas and the air blown in to the producers. An excess of steam is delivered to the producers with the air-blast; the total amount being given as 2·17 tons per ton of coal gasified. Of this quantity 0·85 ton is said to be recovered by the heat exchange system mentioned above and only 0·53 ton decomposed in the producer. In the case under notice the figures were 2·44, 0·85, and 0·22 respectively.

The bye-products recovered consist of sulphate of ammonia, washer dust and liquor, and tar; the last-named being distilled to pitch and creosote. Over a period of eight months, the recovery was as follows, per ton of coal gasified:

	Lbs.
Ammonium sulphate	60·4
Pitch	35·4
Washer dust	100·0
Washer liquor as NH_3	0·76

The nitrogen in the coal was about 1·4 p.ct., which is equivalent to 147 lbs. of ammonium sulphate per ton of coal; and it is claimed that 80 lbs. per ton and over is ordinarily recovered from such coal. There was for a time a loss of ammonia liquors on this plant. The recovery of ammonium sulphate under normal conditions would therefore have been higher. Before being employed for gas-engine purposes, the producer-gas was used merely for boiler firing; and the producers were run with a view to the maximum production of ammonium sulphate, irrespective of the quality and quantity of the gas. The average sulphate recovery over a period of two years was then 76 lbs. per ton.

The power plant, consisting of nine "National" gas-engines (total 11,000 H.P.) of modern design erected in 1916, and direct coupled D.C. generators (7400 KW.), complete with all auxiliaries and exhaust boilers, adjoins the producer plant. The gas-engine plant includes five 1500 H.P. engines, two 1000 H.P. engines, and two 750 H.P. engines. The power plant was designed for the continuous development of 7500 E.H.P. (which is 76 p.ct. of full load), delivered at a steady voltage to the switchboard, with a temporary variation not exceeding 1 p.ct. on changing from full to three-quarter load.

For the purpose of collecting full thermal data of the producer and power plants, it was decided to carry out a test over a period of a week, under ordinary full-load running conditions. The test may be considered to have been carried out under perfectly normal conditions; the only appreciable variation from any other period being in the coal grading. It so happened that the percentage of fines in the coal during the test week was lower than usual. Most of the data for the heat balance were taken at intervals of two hours, day and night, throughout the week.

The gas was carefully sampled and analyzed. Its calorific value was calculated from its composition, and was also determined at frequent intervals by means of a Junkers calorimeter. The figures found on the calorimeter were slightly lower than those calculated from the gas composition. Temperatures were read hourly or twice hourly at all points throughout the producer and gas-cleaning plants; and the electrical units generated were read every quarter-hour on the station ammeters and voltmeters. Some of the more important data are as follows:

Coal gasified	913 tons.
,, fired to boilers	242 ,,
Calorific value of coal	12,550 B.Th.U.
Volume of gas produced	118,700,000 c.ft. sat. at 15° = 110,600,000 c.ft. dry at 0°.

Mean composition of gas: CO, 10 p.ct.; CO_2, 14·9 p.ct.; H_2, 24·2 p.ct.; N_2, 47·8 p.ct.; CH_4, 3·1 p.ct.

Mean calorific value of gas per c.ft. sat. at 15° C.: Net, 126 B.Th.U.; gross, 141 B.Th.U.

Mean composition of engine exhaust gases: CO_2, 15·2 p.ct.; O_2, 2·9 p.ct.

Ratio gas : air used in engines: 1 : 1·35.

Units generated: 975,000 KW.-H.

Throughout the gross calorific value of the coal is taken. This is the almost universal practice; and it might have led to confusion if it had not been followed here. At the same time, it is the net figure which really represents the value of a coal. In the case of the gas, efficiencies are calculated on both net and gross values; but it is those based on the former that are of practical importance. The adoption of the use of the gross value could only lead to confusion, for example, in a comparison between two types of producers. If a recovery producer makes a gas of the same calorific power as a producer run for a high carbon monoxide content, the actual heating and power-raising qualities of the former would be inferior.

For the whole test week, the following are the thermal quantities of the producer plant:

Heat Entering Producer System.

	C.H.U.
As coal gasified	14,250,000,000
As coal burnt under boilers	3,780,000,000
As steam received from engine exhaust boilers	1,420,000,000
Total	19,450,000,000

Heat Leaving Producer System.

Gas—Net calorific value	8,295,000,000
Gross calorific value	9,300,000,000
Available heat, sensible and latent, in gas	4,970,000,000

From these quantities, the following producer efficiencies have been calculated:

	P.Ct.
(*a*) Efficiency on net cold gas value and gross heat used on producer plant	42·7
(*b*) Efficiency on gross cold gas value and gross heat used on producer plant	47·8
(*c*) Efficiency on gross hot gas value and gross heat entering producers	80·9
(*d*) Efficiency on net cold gas value and gross coal used	46·0
(*e*) Efficiency on net cold gas value and coal gasified only	58·2

The distribution of the heat units entering the producers is as follows:

	P.Ct.
Calorific value of coal	80·9
Heat gained in air-heating tower	6·0
Heat in steam added	10·7
Heat gained in superheaters	1·8

Of the above efficiencies, it is (*a*) which really gives the effective efficiency of the plant, while (*d*) does not debit the producers with the steam supplied by the engine exhaust boilers. (*e*) is the efficiency on the coal gasified only. It is a figure which would have been more nearly approached if the boiler plant had been of up-to-date construction. The efficiency of heat exchange in the superheaters (the ratio heat gained by air to heat lost by gas) was 69 p.ct.; while that of the air heating, gas cooling towers was 74 p.ct. (*f*) During the test week the electrical units generated amounted to 975,000 KW. = 1,849,000,000 C.H.U. The generator efficiency was 93 p.ct. within 0·5 p.ct.; and therefore the thermal equivalent of the brake-horse-power-hours amounts to 1,988,000,000 C.H.U. The mechanical efficiency of the engines was not known exactly; but recent tests on similar engines gave 85 p.ct. Taking this figure, the thermal equivalent of the indicated-horse-power-hour would be 2,338,000,000 C.H.U. From these figures, the following efficiencies have been calculated:

(*a*)	Thermal efficiency on	gross coal used	and	e.h.p.	produced 10·2 p.ct.
(*b*)	,,	,,	,,	b.h.p.	,, 11·0 ,,
(*c*)	,,	coal gasified	,,	e.h.p.	,, 12·9 ,,
(*d*)	,,	,,	,,	b.h.p.	,, 13·9 ,,
(*e*)	,,	gross gas value	,,	e.h.p.	,, 19·9 ,,
(*f*)	,,	,,	,,	b.h.p.	,, 21·4 ,,
(*g*)	,,	net	,,	e.h.p.	,, 22·3 ,,
(*h*)	,,	,,	,,	b.h.p.	,, 24·0 ,,
(*i*)	,,	,,	,,	i.h.p.	,, 28·2 ,,

The outstanding feature of the above calculation is the producer efficiency, which is very low compared with text-book and catalogue figures. The low over-all efficiency is partly due to the exceptionally low efficiency of the boilers; but taken on the coal gasified alone, the figure is still a poor one. With more efficient waste-heat boilers, it is probable that all the steam required on the producers could be derived from this source. The gas-engine efficiency of 24 p.ct. is a very fair figure, considering the conditions. With a gas supply of more constant composition, the engines could no doubt be tuned-up to run at higher efficiency; but the variability of the quality of the gas would not allow much closer tuning without a sacrifice in reliability.

The suitability for power and other purposes of the gas made under recovery conditions has been the subject of much discussion. It has been pointed out that the conditions for a good power gas and for ammonia recovery are to a certain extent antagonistic; and while a gas containing a high percentage of hydrogen may now be used with complete success in gas-engines, it nevertheless appears to be a fact that the value of hydrogen compared with (say) carbon monoxide, for power-raising purposes, is less than the relation between the net calorific values of the two gases would indicate. A high content of hydrogen reduces the permissible compression on the mixture. It has been argued, since the percentage of hydrogen in the cylinder mixture when coal gas is being used is lower than in the case of producer gas, while the safe limit of compression is higher for the latter gas, that the hydrogen plays a minor part, and it is unsaturated hydrocarbons which are the determining factors. While olefines, &c., no doubt tend to cause pre-ignition, it seems certain that hydrogen itself is by no means an unimportant factor; and it is well known that trouble is frequently experienced on engines running on blast-furnace gas when the hydrogen in that gas increases in wet weather.

Bone and Wheeler have shown that the efficiency ratio for a producer decreases with an increased use of steam, though they did not carry their saturation temperature as high as that used in ammonia recovery. The volume of gas increased, but its calorific value dropped; the hydrogen and carbon dioxide content increasing, and the carbon monoxide diminishing. The net calorific value, of course, decreases considerably more than the gross value.

The advantages claimed for the combination of a Mond recovery plant with gas-engines are:

(1) Such a plant is capable of utilizing cheap fuels unsuitable for boiler firing.

(2) It secures a high recovery of ammonium sulphate.

(3) The thermal efficiency of the producer as a gas-generator is higher than that of a boiler as a steam-generator.

(4) The efficiency of the gas-engine is much higher than that of any steam-engine.

Cheap coal is no longer available, and the difference in price between producer nuts and good steam coal is now inconsiderable. With mechanical stoking plant a low-grade coal containing much dust may be used to better advantage for steam raising than in most producers. Since the price of producer coal at the pit-head has gone up to several times its pre-war price, while that of sulphate of ammonia is only about double, the recovery of the latter in a Mond plant is now a much less attractive undertaking. The capital cost of the plant—always high—might now easily be prohibitive; and the higher price of coal renders it imperative to use a producer with the highest possible thermal efficiency. In this respect, the Mond type would appear to compare unfavourably with non-recovery producers.

SUMMARY OF INVESTIGATION.

Mond Gas.

(*a*) That a reasonably high ammonium sulphate recovery demands low temperature and correspondingly low producer gasification capacity, while simultaneously the gas produced is less suitable for power purposes than that made in non-recovery producers.

(*b*) That at full load a gas suitable for the engines was obtained only at the sacrifice of ammonium sulphate recovery.

(*c*) That a large amount of steam is used, demanding a considerable boiler installation and fuel usage.

(*d*) That the capital outlay and running cost of the plant represent a combined charge which can only be counterbalanced by a comparatively low-priced fuel, and a high market price for the bye-product.

The Gas-Engine.

(*a*) That steady running and reliability are obtainable, given the necessary skilled attention and a gas of even character and value.

(*b*) That the time lost for repairs is almost negligible.

(*c*) That oil consumption can be kept at a low level, and one that compares not unfavourably with steam practice.

(*d*) That relatively low hydrogen and high carbon monoxide proportions make for steadier and cheaper running than when the order of these constituents is reversed.

(*e*) That efficiency falls very rapidly as load decreases.

(*f*) That a thermal efficiency of 26 p.ct. at full output, and with a steady suitable gas supply, is obtainable.

(*g*) That natural gas, blast-furnace gas, and coke-oven gas represent a wide and favourable field for the gas-engine.

(*h*) That the gas-engine plant as a whole gives little trouble, and satisfactorily stood-up to its tests on full load and part load, and also under ordinary working conditions.

GENERAL CONCLUSIONS.

The authors have endeavoured to make it clear that the producer plant under consideration was a poor exponent of the system because of its age, which necessarily involved some principles of obsolete practice and much time-worn material. As a plant from any modern standpoint, it therefore stands condemned on these grounds alone. But apart from the actual mechanical arrangements of this particular plant, they have endeavoured to ascertain the merits of the principle of gasification with ammonia recovery, and on certain broad lines have indicated that its profitable application is limited to given cases in which low-priced coal and high-priced bye-products are inseparable features. Even then the work tends to prove that the simultaneous production of a high-grade gas for power purposes with a maximum yield of ammonium sulphate is not economically feasible, and that either one must be partly sacrificed to produce the best return of the other.

Great pains were taken to get accurate figures throughout; and particular attention was given to the determination of the volume of the gas. This, being a fundamental in the computation of the results, was very necessary. They have not seen anywhere before the combination of calculations used in this connection. Their experience does not confirm the suggestion that good results are obtainable from low-grade slack unsuitable for other purposes; while the outlook for high prices for ammonium sulphate appears to be problematical in view of the projected synthetic ammonia plants. Furthermore, the authors have found that the process is not by any means what they can describe as being fool-proof or simple.

To avoid any possible misunderstanding, it should be stated that they are dealing with ammonia-recovery systems only; and the results are not in any way applicable to ordinary gas-producers of either the pressure or suction type. The excess steam used in the recovery process constitutes a distinct dividing line. The gas-engine plant is, of course, a unit quite separate from the producer plant. It was a thoroughly workmanlike, up-to-date installation, and satisfactorily discharged its duties.

The contentions and statements of the authors are uncoloured by any glint of prejudice; and for whatever they are worth, they submit them with this assurance. In characterizing this particular Mond plant as a poor one, they desire to state that there were sufficient reasons for that condition; but they are not judging the principle wholly on that or any other extraneous grounds. Their object has been to elicit from the available data, first, what the efficiency of the plant was; secondly, where and why it failed in economy; and, thirdly, what bearing this evidence has on the future of Mond gas. In arriving at their conclusions, they have spared no effort to get at the truth; and any errors that occur must be attributed to faulty judgment rather than lack of industry or fair purpose.

At a meeting of the Association of Engineers-in-Charge, at St. Bride's Institute, E.C., this (Wednesday) evening, Captain H. J. Wellingham, M.C., Assoc.M.Inst.Mech.E., will read a paper entitled "Some Practical Notes and Observations on Land Type Boilers."

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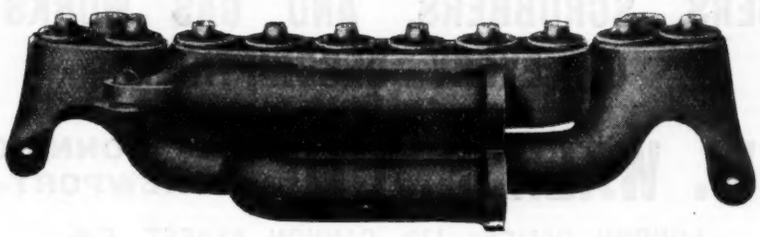

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A GASHOLDER ON FIRE.

An accident that might have had very serious consequences was described recently in "Das Gas- und Wasserfach" by Herr Görhum, of Stuttgart. At about midday on Nov. 16 last, two officials passing a 100,000 cub.m. [over 3½ million c.ft.] holder at the Stuttgart-Gaisburg Gas-Works heard a loud and strange noise, and, looking up, saw flames issuing from a considerable part of the circumference of the tank. The alarm was given, and at first it seemed likely that the fire would be extinguished with the available hand apparatus; it being due apparently to the coating of oil on the tank water having somehow become ignited. Unfortunately, the holder was fairly full, and the expansion of the gas due to the heat soon caused it to blow, and the gas escaping at the bottom burned into huge flames. These, in turn, ignited the oil layer in the cups of the upper lifts, and before long the entire holder was enveloped in flames.

By this time the fire brigade had arrived, and by energetic spraying they managed so to cool the gas in the lowest lift that it returned to the water. This prevented what had seemed to be the greatest danger—namely, that the iron construction might become red-hot and collapse. Meanwhile, however, the riveted joints of the two lower lifts, which were tightened with oiled fabric, were becoming insecure, and quantities of escaping gas ignited. These had to be continually sprayed, to prevent them from cracking entirely. The holder was next cut-out entirely; and, as the gas remaining in it cooled, it was soon clear that the lifts were still capable of working properly in a downward direction. It was therefore decided to try to empty the holder as quickly as possible, by opening the outlet to the town mains, and also allowing gas to pass into the open through the balloon valves. In this way the two burning lifts were gradually lowered into the water, and the fire extinguished. It was not until nearly four o'clock that the fire brigade could leave the scene.

In spite of every effort, the cause of the ignition of the oil has never been discovered. All the men were away at dinner, and no work had been done on this or the neighbouring holder that day. An eye-witness from over 100 yards distance deposed to having seen vertical spurts of water rise from the tank, but not such as occur when a holder blows in the ordinary way. These were immediately followed by a flame, which spread rapidly to both sides and upwards. As a result of the accident, the two lower lifts of the holder have to be replaced, and parts of the framework were considerably distorted by the heat. Fortunately, it did not contract, but rather gave more room for the guiding runners of the lifts to move freely up and down. The management can congratulate themselves that no serious explosion occurred. They say the conduct of officials and men was exemplary.

AMERICAN GAS STATISTICS.

Statistics compiled by the American Gas Association, for the year 1920, show that the manufactured gas business of the United States took-on 2,617,000 new customers, increased its meters in use by nearly 500,000, and beat all past records by running-up its total annual sales of gas to a new high figure of 319,888,000,000 c.ft., which is more than three times the amount of gas consumed by the American people twenty years ago, and more than double the amount used ten years ago. These figures are based upon information received from various authoritative sources to include all of the 966 manufactured gas companies of the country, which serve approximately 4600 cities, towns, and villages. The increased use of gas in the home, and the growing popularity of gas-burning appliances, have been particularly marked in the last few years. The Association report 6,670,000 domestic cooking appliances in use. This is an increase in one year of 260,000. Gas water-heaters of all types number 1,423,000, or an increase in one year of 100,000. Altogether there are in use in American homes 9,217,000 gas-burning appliances of all kinds. Figures also show that the use of gas for industrial purposes is steadily increasing. There are now more than 1200 different ways in which it is being utilized. Of the total amount of manufactured gas sold, 21 p.ct. is for illumination, 54 p.ct. for domestic uses other than illumination, 21·67 p.ct. for industrial uses, and 3·83 p.ct. for other uses not classified. The number of coke-oven plants selling gas to distributing companies is 86. Of the 966 companies, 444 manufacture water gas exclusively, and 220 coal gas exclusively. The total number of consumers is 8,837,270; and the annual consumption per meter, 35,622 c.ft. The incandescent burners for illumination (not including "arc" lamps or street-lamp burners) number 10,000,000; and the number of persons employed by gas companies as officers and salary and wage earners was 71,000. There are about 70,000 miles of gas-mains in the United States.

Gas Fatality at Halifax.—Thomas and Annie Turner, husband and wife, living in Victoria Street, Greetland, who were found unconscious in bed recently, suffering from gas poisoning, have since died, on different dates, at the Halifax Infirmary. They had not been seen for some days; and a policeman broke in the door. It is thought they left a low light burning at night, and that it must have been blown out or by some other means been extinguished, leaving the gas on.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Blue Water Gas Report of the Gas Investigation Committee.

SIR,—The following letter has been received from Prof. Cobb and Dr. Parker, with reference to Mr. E. G. Stewart's letter on the above.

W. T. DUNN, Secretary.

Institution of Gas Engineers,
28, Grosvenor Gardens, S.W.,
Feb. 3, 1922.

[ENCLOSURE.]

The University, Leeds,
Feb. 2, 1922.

SIR,—Please allow us to thank you for your interesting explanatory letter of Dec. 20, in reference to the reply to the discussion on the Sixth Report of the Gas Investigation Committee.

We certainly were unaware (and are surprised to learn) that the thermal balance given with your contribution did not refer to the plant fitted with the waste-heat boiler, but to another plant, or the thermal analysis given in our reply would not have been undertaken.

The correspondence strengthens our opinion that no tests can be regarded as satisfactory for our purpose in which the performances of the water-gas plant and the waste-heat boiler are not ascertained on the same plant and at the same time.

It is gratifying to learn that you found our reply generally satisfying as regards the reasons underlying our lines of argument; and though some points of difference remain, we share your belief that the results of our present inquiry should settle any difference of opinion between us.

(Signed) JOHN W. COBB.
A. PARKER.

E. G. Stewart, Esq.,
Gas-Works, Fulham, S.W. 6.

Calorimetry Report of the Gas Investigation Committee.

SIR,—I am enclosing herewith reply by Prof. Cobb and Mr. James W. Wood, to the letter from Dr. J. G. Stewart which appeared in your issue of Jan. 11 [p. 99].

W. T. DUNN,
Secretary.

Institution of Gas Engineers,
28, Grosvenor Gardens, S.W., Feb. 4, 1922.

[ENCLOSURE.]

Department of Coal Gas and Fuel Industries
(With Metallurgy),
The University, Leeds,
Feb. 3, 1922.

SIR,—The opening paragraph of Dr. Stewart's letter discloses some mutual misunderstanding. If it is proposed to bring a portable still-water calorimeter into a testing-room, draw a sample of gas close to the recorder, and almost immediately determine the calorific value of this gas with a view to checking the reading of the recorder, then sampling difficulties and deterioration of the sample before the test is completed are negligible. Our criticism was aimed at small samples, collected over lengthy periods, and transported elsewhere for testing, and purporting to be accurate average samples of the gas made or sent out over such period. There is no desire to impugn the accuracy of the still-water calorimeter; but undoubtedly it requires considerable manipulative skill to attain the same accuracy as with a well-designed and properly-used flow instrument.

Dr. Stewart points out the liability of flow-calorimeters to considerable radiation (and other) gains or losses, and gives illustrative figures the accuracy of which we do not challenge. It does not follow, however, that the results finally returned will be afflicted with this error, if the calorimeter is used by a competent operator. When using the Junkers calorimeter for intermittent hand testing, we find no difficulty as a rule in regulating the inlet water temperature so as to be within 2° C. of room temperature, and, in fact, prefer it to be 2° C. below room temperature. When such regulation is for any reason not possible, the radiation gains or losses are known, and the calorific value is corrected accordingly. The same principles of operation must be observed with the still-water calorimeter if the results are to be reasonably accurate.

The difficulties in regulation of inlet water temperature for a continuous water-flow calorimeter are considerable; but we are not so sceptical as Dr. Stewart with regard to a practical solution of this problem.

Dr. Stewart's closing paragraph calls for an investigation which we would only too gladly take up, were it not for the fact that the gas industry is confronted with problems of greater immediate importance. Moreover, the question has been excellently treated by the American Calorimeter Committee, by the Bureau of Standards, Washington, and by J. H. Coste in his "Calorific Power of Gas."

(Signed) JOHN W. COBB, Secretary.
JAMES W. WOOD, Research Chemist
of the Gas Research Sub-Committee.

The Therm and Gas-Works Practice.

SIR,—I wish to correct an error of term in my communication to you of Jan. 23 [*ante*, p. 213], and one which is easy to make during the transition period from "volume" to "therm."

The comparative figures should read "volumes" not "therms;" and with that correction the original letter holds good.

Gas-Works, Whitchurch, Salop, Feb. 3, 1922. J. F. TYNDALL.

SIR,—In your issue for Jan. 18, I stated my views as to the influence of the therm on gas-works practice. Three correspondents were good enough to comment thereon—adversely in two cases. I should now like to give the reasons for my brief assumption of the *rôle* of prophet, especially as your correspondents confirm my statement that the importance of the therm is not appreciated.

Mr. Tagg complains that I am making comparisons on revenue only, and proceeds to show that revenue could be still further increased by handling more coal. Let us therefore take dividends as our basis, for, however we look at it, the deciding factor is profit. It would require a great deal of space to go fully into details; but fortunately we can make a general comparison very quickly.

Our first undisputed fact is that we are selling therms, not cubic feet; so we must not base our costs on volume of gas. It is obvious that when in one plant we produce 70 and in another 210 therms from a ton of coal, our raw material, and the handling of it, will cost the same in each case. Opinions may vary as to the relative capital, purification, and storage costs; but I think it will be quite fair to assume that these are identical also where equal quantities of coal are treated. Our highest working costs are raw material and the handling thereof; so that we may say that, for purposes of comparison, our total production costs are directly proportional to the quantity of coal purchased.

We have three alternatives:

Scheme A.—100 tons of coal, 7000 therms. Revenue, £480. Capital cost x, and working cost y.

Scheme B.—300 tons of coal, 21,000 therms. Revenue, £1440. Capital cost $3x$, and working cost $3y$.

Scheme C.—100 tons of coal, 21,000 therms. Revenue, £1050. Capital cost x, and working cost y.

Scheme A represents present practice. We are selling 7000 therms, and making a comfortable dividend of (say) 5 p.ct. We are not expanding very much. We pick up a few new consumers by the natural increase in the population—so do our electrical friends. But we must live and let live. True, some of our consumers are rather abusive at the size of their gas bills; but what would you? Vertical retorts are very expensive; and the costs of coal and labour are scandalous. Still, we shall be pleased to pass on any reduction we obtain; and we shall still have our 5 p.ct.

Scheme B arouses a momentary flicker of interest. Three times the output, three times the coal, three times the capital; but, unfortunately, not three times the dividend, in which respect we are still in *status quo*. But wait! We have to sell three times the gas. We have created a supply for which there is no demand, so we reluctantly reduce the price of our surplus gas. Farewell to our little 5 p.ct. Our last state is worse than our first.

We therefore rule out Scheme B because we see that, unless our receipts for residuals are so high, or our working costs so low, and we can therefore afford to ignore the surplus gas—waste it, burn it, or give it away—we are in a less favourable position. We know there have been cases where such a state of affairs has actually obtained; but somehow they always happen to the other fellow—and after all our *raison d'être* is gas.

Scheme C remains. We again produce three times the therms. We must avoid falling into "B's" error; so we decide to reduce our price to 6d. per therm to enable us to sell our gas, and we are surprised to find that, although we have made a 50 p.ct. cut, we still retain our 5 p.ct., or even a little more.

It may be asked why we should engineer a revolution if our dividends are not substantially to be increased. The answer is that we have reduced the price of gas. Not only has this reduction *per se* swallowed up our surplus gas, but it has put us in a much stronger position with our competitors, and opened-up fresh fields. Further, it has retained large industrial consumers we should inevitably have lost had we persisted in keeping the price at 1s.

In the first issue of your supplement—"The Gas Salesman"—a correspondent gives us a glimpse of the promised land, saying: "What a vast opportunity for development! Let's be up and at it." How can we develop if we do not reduce the price of gas? At present we are approaching an *impasse*. If we want to sell more, we must buy more coal; if we buy more coal, we cannot reduce the price.

Mr. Tagg will doubtless retort that Scheme C is very nice indeed—if we do not happen to live in Preston. Preston is in Lancashire, where the hard-headed business men come from; and to drive a bargain is to them the salt of life. They will refuse to consume three times the gas if we reduce the price by only a paltry half. Moreover, we have sacrificed our surplus profits in reducing prices, and we have not the wherewithal to remodel our distribution system. Again *cui bono?*

Here is our opponent in all his shining armour; and although we know a lath may be painted to simulate iron, we prepare for the worst and bring out Scheme D.

Scheme D is 33 tons of coal, 7000 therms. Revenue, £350. Capital $\frac{x}{3}$, and working cost $\frac{y}{3}$. We have a market for our goods, so we do not reduce the price; and we find our dividend is approximately doubled. We borrow another 50 p.ct. capital for alterations to our meters and services (not mains), and we still pay about 7 p.ct. We are better off (for the present); but we have not set the Thames on fire.

But Mr. Tagg's motto is "death before surrender;" and he has one more weapon left. He points out that we have plumped for Scheme C; and although we have reduced the price of gas, enlarged our field and ousted our competitors, we have only considered the manufacturing side—we are neglecting the distribution department, we are swallowing the jam with gusto and carefully avoiding the pill.

We admit that the question of distribution requires investigation; but, fortunately, we have a little breathing space, for it is possible to make 450 B.Th.U. gas in a complete gasification plant. Hence, the transition to the lower value may be gradual, giving time for the elucidation of questions of volumes and chemical reactions in services. Someone is sure to ask us why we need go to 350 B.Th.U. at all. The answer is "dividend." The 450 B.Th.U. gas costs more to make, and the profits are below Scheme C if the price of gas is similarly reduced.

I have now stated the advantages which appear to me to be derived from complete gasification; and I support Scheme C because it represents the broader view—because it allows us to develop and expand. We must remember that our present cherished 5 p.ct. will only remain faithful to us as long as the generous prices we have put against residuals are maintained; and also we should not forget that we must either go forward or backward—we cannot stand-at-ease.

"Engineer" develops his criticism on similar lines to that of Mr. Tagg, and further advises us "to stick to the therm."

> "I thank thee Roderic for that word;
> It nerves my hand, it steels my sword."

I offer him more therms to stick to—and in the gas, where he wants them, instead of in the residuals. I point out that we can get three times the number of therms from the same amount of coal; and he replies "We do not sell coal." We may rejoice in that fact; but we have also sorrowfully to admit that we have to purchase it.

Surely I am correct in saying that if we double the output from the same amount of coal, our production cost per therm is halved. "Engineer" appears to suggest that the production cost per therm is the same in each case. Well, well, we live and learn. Somebody ought to break the news without delay to poor Mr. Henry Ford, who has "fallaciously argued" himself into producing three motor cars from a ton of steel. He should be told that it is more profitable to make one car only and sell the scrap. When we buy coal, we buy therms in a cheap (save the mark) form. We ladle out those therms into the gas, and sell them at a higher rate. The fewer we spill on the floor the better for us.

In reply to Mr. J. F. Tyndall, a therm is a therm whether dressed in its working clothes of 350 B.Th.U. gas or in its Sunday suit of 450 B.Th.U. gas. The consumer will not worry about its garments so long as he gets the therm, and gets it cheap.

I believe that if the industry can produce cheap gas, it will not need to worry about the sale of it; and, incidentally, the health of the community will benefit. I have endeavoured to show that present methods are not conducive to the cheap therm; and I have at least indicated one way to a reduction. There may be others. If anyone "knows of a better 'ole," I should be pleased if he would point it out.

I thank you, Sir, for your editorial comments. I am looking ahead a long way, of course. But "where there is no vision the people perish;" and even an Act of Parliament does not confer immortality on any undertaking. My remarks may be considered idealistic and theoretical; but I feel sure the whole question merits the serious study of the engineers of a live industry. Prophecy may be rash. Perchance I am too optimistic on the problems with which engineers will have to wrestle; but I cannot eradicate from my mind the disturbing fact that here we have an industry producing only 70 articles when it is possible to produce 200 from the same quantity of raw material, and again I ask: Is that the way to cheap gas?

A. MACGREGOR.

43, *Whitelow Road, Chorlton cum-Hardy, near Manchester, Feb.* 2, 1922.

"The Five-Legged Rabbit."

SIR,—The writer's attention has been drawn to Mr. C. B. Tully's letter to the "JOURNAL" of Jan. 11. The letter certainly calls for criticism; and in venturing to put forward such, the writer does so with diffidence, bearing in mind the yeoman services Mr. Tully rendered to many smaller works during a time of great crisis, when the necessity of increasing output from a ton of coal on a small expenditure of capital was paramount. No one more clearly recognizes this than the writer. Therefore he is sure that Mr. Tully will take in good part what the writer has to say; and any criticism will be strictly confined to a review of Mr. Tully's own figures.

From a South Yorkshire steam coal, Mr. Tully claims to have produced, from a 300,000 c.ft. per day plant, 50,000 c.ft. per ton of 422 B.Th.U.

The analysis of this gas is given as:

	P.Ct.
CO_2 and H_2S	2·1
O_2	0·3
CO	39·2
C_mH_n	1·5
CH_4	12·2
H_2	41·0
N_2 by difference	3·7
	100·0

One's attention is immediately drawn to the 12·2 p.ct. of methane, which amounts to 6100 c.ft. per ton of coal. If one does not misread the figures, this means 6100 c.ft. of actual methane; and its, so to speak, only source would be from the coal distilled in the low-temperature retort superimposed over the water-gas producer.

The writer's experience with low-temperature carbonizing is that, with a properly constructed retort, the gas per ton amounts to some 5000 c.ft., including methane, of 650 to 700 B.Th.U.; but we will take Mr. Tully's 6100 c.ft. of pure methane. If the retort were a high-temperature one yielding (say) 12,000 to 13,000 c.ft. per ton, the percentage of methane would approximate to 36 p.ct. in the gas. With a low-temperature retort, the gas would contain round about 60 p.ct of methane, so that the 6100 c.ft. would only contain approximately 3600 c.ft. of actual methane.

When we come to the B.Th.U. values of the gas, stated to be 422 and 412 B.Th.U., there must be something wrong, because, if the value of the ingredients of the Tully gas be dissected, they only amount in net useful value to 390 B.Th.U., which is well on the optimistic side.

The most interesting feature, however, is to strike a thermal heat balance. We have, to start with, what Mr. Tully puts into his apparatus. He does not tell us what was the thermal value of the South Yorkshire steam coal operated upon, which, after all, should be the starting-point; but we will take it at 13,500 B.Th.U. = 30,000,000 B.Th.U. per ton. During the passage of these 30,000,000 B.Th.U.

per ton through the plant, there are considerable and well-known losses—viz.:

1.—Value of the sensible heat of the gas when leaving the producer at about 1000° Fahr., equivalent to	1,000,000 B.Th.U.
2.—Equivalent value of the "blow gas." At least 2 c.ft. of blow gas would probably be made per cubic foot of Tully gas. The value of the sensible heat in the same when leaving the producer at the same temperature—viz., 1000° Fahr.—is equal to	2,000,000 B.Th.U.
3.—Presuming that, under ideal Tully conditions, all the latent heat in the blow gas is utilized for water-gas making, the latent heat is equivalent to not less than	9,700,000 B.Th.U.
4.—Loss of unburnt carbon in the ash from the producer will probably be round about 5 p.ct. of the total fuel value, corresponding to about	1,500,000 B.Th.U.
5.—Radiation and convection losses will, according to ordinary water-gas practice, amount to 1½ p.ct. on total fuel value, equivalent to	500,000 B.Th.U.
Total losses	14,700,000 B.Th.U.
Total losses	14,700,000 B.Th.U.
Add what Mr. Tully claims to gain—viz., 50,000 c.ft. per ton × 422 B.Th.U. =	21,100,000 B.Th.U.
	35,800,000 B.Th.U.
Deduct 30,000,000 B.Th.U. put into plant	30,000,000 B.Th.U.
Out of the nowhere = *120 p.ct. efficiency!*	5,800,000 B.Th.U.

And this is not taking into consideration the considerable steam losses.

In the days of my boyhood, my hero was the gentleman who out of an empty hat produced a four-legged rabbit. Mr. Tully puts him in the shade; for, having introduced a four-legged rabbit into the hat, he produces *a five legged one!*

I raise my hat to Mr. Tully.

F. D. MARSHALL.

19, *Queen Anne's Chambers, Westminster, S.W.*,
Feb. 6, 1922.

Deposits in Gas Pipes and Meters.

SIR,—In your current issue, p. 266, there is an article entitled "Deposits in Gas Pipes and Meters," purporting to be a report for 1921 of the American Gas Association Committee. In looking this through, I find that certain paragraphs describing the chemical processes by which corrosion is supposed to take place within gas-mains are taken practically verbatim from the report of our own Life of Gas-Meters Committee dated April 29, 1920. The classification of reactions, with accompanying explanation, is identical with that prepared for the Committee by Mr. J. G. Taplay, and published in our report.

I am not complaining of the quotation, as I am sure Mr. Taplay will be glad to find that the maximum use has been made of his researches. In our report at the annual meeting in 1921, we quoted extensively from previous reports kindly sent us by the American Gas Institute; but we gave full acknowledgment of the source. It is quite possible that anyone making a digest of our report might take some of the matter thus quoted as our own, and overlook the acknowledgment. Possibly your reviewer may have done the same in making a digest of the American report; and perhaps somewhere within its pages there is a reference to the work of Mr. Taplay and the Special Committee of our own Association.

B. R. PARKINSON.

Cottage Lane, City Road, London, E.C. 1,
Feb. 3, 1922.

"The Weak Spot of the Industry."

SIR,—As a member of the National Association of Technical Gas Officials, I am very interested in the letter from Mr. Shadbolt and your comments thereon.

For some time now, I have been wondering whether the Association was really alive, as so little has appeared as to its activities; but, reading between the lines, apparently the Executive Committee have been busy, though the negotiations carried on were of such a nature that publicity could not be given to them. But, even now, I find it difficult to believe what Mr. Shadbolt's letter suggests.

For many years we have been hearing of the wonderful new spirit in the industry which has been growing up between the Federation of Gas Employers and the Federated Trade Unions—how that the spirit of co-partnership was being brought into the lives of gas-works employees, even if not its direct financial advantages. Can the National Association of Technical Gas Officials have approached the Federation of Gas Employers or the National Gas Council, and asked them to deal with gas officials' salaries in the adequate way of which they are quite capable? If they have, and they have been (to put it bluntly) turned-down, it makes the position very much clearer. It shows that, even to-day, the honeyed words of the directing side of the industry are the result of the "big stick" from the working side; and it will behove gas engineers to leave the negotiating kid-glove stage to a later period, and adopt the tactics of the workman.

I would like to add that I, for one, would regret this. I was very pleased to see in the installation of the new Executive Committee that they quickly decided that it was contrary to the interests of the Association and industry at large for the former to adopt trade union methods. However, needs must when the devil drives.

I enclose my card, and beg to subscribe myself

"MEMBER."

Feb. 4, 1922.

Workmen's Compensation Insurance.

SIR,—As the Brokers responsible for the scheme of insurance of which advantage is now being taken by a large and increasing number of gas undertakings, we feel that there are one or two aspects of the question which may have escaped the attention of those responsible for gas administration.

Up to the present, we have negotiated policies at Lloyd's for over a hundred Gas Boards or Committees at rates which, in the aggregate, represent a saving of thousands of pounds annually to the gas industry. We would like to make it known, however, that these rates, low as they are, do not represent the minimum which underwriters would be prepared to offer, if they could be assured that a reasonably large proportion of the industry would insure this risk with them. The greater the amount of business so placed, the greater the all-round reduction which could be made. It must not be thought that this implies that an undertaking with a favourable claims experience would be made to pay for another whose experience had been less favourable—this is not intended. Each undertaking will, as heretofore, be rated upon its individual experience; but the difference between the experience and the rate quoted will be reduced in proportion as the volume of business increases.

In some cases we find that the rates which underwriters have quoted—though these rates represent one-half of those at present being paid—have been used by undertakings merely as a lever to force a reduction from existing insurers, who, upon allowing a reduction, are permitted to retain the business at a rate higher than that quoted by Lloyd's. We submit that this is a policy which benefits neither the undertaking nor the industry in general, but is, on the contrary, one which, if adopted by Committees, or Boards of Directors generally, would make it impossible for underwriters to quote the still lower rates which, if the industry supports us, we are confident we can obtain, and with which we feel certain it will be impossible for anybody successfully to compete.

With regard to the settlement of claims, Lloyd's reputation for promptness and satisfaction is proverbial. Not a single complaint has reached us; and gas undertakings may rest assured that the treatment which they will receive will give no cause for complaint.

We would add that we can offer to gas undertakings the opportunity of effecting a saving in other branches of insurance similar to that which we have already obtained for them in regard to Workmen's Compensation. Several undertakings (and among them some of the larger) have taken out policies through us in respect of fire (including explosion and spontaneous combustion), third party liability, motor vehicles, marine, wagon liability, &c., at rates which show a substantial saving upon those which they had been accustomed to pay.

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(and at Lloyd's), Feb. 3, 1922.

Buxton Gas Undertaking.—At a recent meeting of the Buxton Town Council, it was reported that the make of gas from March 31 to Dec. 31 last was 110,694,000 c.ft., compared with 102,361,000 c.ft. for the corresponding period of the previous year—an increase of 8,333,000 c.ft. The revenue from tar and liquor for the nine months showed a decrease of £2850, as compared with the corresponding period of 1920.

Tipton Gas Finances.—The Gas Committee of the Tipton Urban Council reported to a meeting last week that the sanction of the Ministry had been obtained to the loan of £1500 for the laying of the new main at Dudley Port, subject to the same being repaid in five years. It was reported that the output of gas showed a decrease of 5·2 p.ct. The financial position of the undertaking was fully considered; and a Sub-Committee recommended that they write to the Ministry of Health on the following lines: That the Council, in view of the depressed state of trade, have endeavoured to carry on the undertaking without taking advantage of the statutory provisions enabling them to increase the maximum price per 1000 c.ft.; that to save permanent heavy interest charges the Council paid off a loan of £3000, and carried out certain permanent capital works at a cost of £3285, which has been charged to revenue, making the total capital charges paid out of revenue during the last financial year £6285; that the residuals have become almost unsaleable; that the sum of £3000 be reborrowed; and that application be made to the Ministry of Health for sanction to the borrowing of the sum of £3285 above referred to, and to the repayment of the overdraft being spread over a period.

An Interval for Pleasure.—The Grosvenor Dining Club (comprised in the membership of which are the staffs of the "B.C.G.A.," the British Sulphate of Ammonia Federation, Ltd., the Institution of Gas Engineers, the National Benzole Company, Ltd., and the National Gas Council of Great Britain and Ireland), held their first social event at the Caxton Hall, Westminster, on Wednesday evening last. The function took the form of a whist drive and fancy dress dance, and was attended by some 250 members and friends. A goodly array of prizes had been provided, many of which had been very kindly given by principals of the various organizations concerned, and were presented during the interval by Mrs. Tibbitt, wife of the President of the Club (Mr. A. J. Tibbitt, General Manager of the National Benzole Company, Ltd.). At the conclusion of a most enjoyable evening, Messrs. H. B. Lewis and H. Jones, Masters of Ceremony, and the Management Committee, of which Mr. P. G. Somerville (Assistant General Manager of the National Benzole Company, Ltd.) is Chairman, were accorded well-merited thanks for the successful manner in which they had conducted the arrangements. During the evening, the assembly was graced by the presence of Mr. D. Milne Watson (the Governor of the Gas Light and Coke Company), Mr. Read (Vice-Chairman of the National Benzole Company, Ltd.), Mr. W. B. Farquhar (the Engineer and Manager of the Ilford Gas Company), and Mr. E. G. Hutchinson (the Engineer and General Manager of the Richmond Gas Company).

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications to the Board of Trade under the Gas Regulation Act.

Bideford Gas and Coke Company, Ltd.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 10d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 15·45d. per therm.

Mid-Kent Gas Light and Coke Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price which they have asked the Board of Trade to substitute is 1s. 7·6d. per therm.

It is also proposed that additional charges per therm should be authorized in respect of gas supplied through a prepayment meter, varying according to whether such meters are with or without fittings, or with a cooker and fittings.

DECLARATION OF CALORIFIC POWER.

Rossendale Union Gas Company.—475 B.Th.U. (Feb. 1.)

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Brecon Gas Company.

After the declared date, the price of 19d. per therm shall be substituted for the price of 4s. 7d. per 1000 c.ft.; and the rate of discount of 1d. per therm shall be substituted for that of 5d. per 1000 c.ft. in section 23 (fixing maximum price of gas, with sliding-scale as to dividend) of the Brecon Gas Order, 1882.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft before the declared date shall be rendered into the equivalent price per therm by dividing it by five. (Feb. 1.)

St. Helens Corporation.

As from the declared date, the maximum price in respect of gas supplied by the undertakers within the borough of St. Helens shall be 14·4d., and without the said borough 15·6d. per therm. (Feb. 3.)

Weymouth Consumers' Gas Company.

As from the declared date, the maximum prices in respect of gas supplied by the undertakers shall be 14·6d. and 15·8d. per therm; and these prices respectively shall be substituted for the prices of 4s. and 4s 6d. per 1000 c.ft. mentioned in section 11 (limiting the price of gas) of the Weymouth Consumers' Gas Act, 1897. (Jan. 26.)

Worksop Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 14·2d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-seven-tenths. (Feb. 2.)

TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

At the annual meeting on Friday of this week, the Directors will submit the accounts for the year ended Dec. 31.

In their report, they state that the Tottenham Gas (Charges) Order, dated April 20, 1921, issued under section 1 of the Gas Regulation Act, 1920, provides for the sale of gas on a heat unit basis, instead of by volume. The provisions of this Order came into operation on May 1, 1921. Under the new Order, the sliding-scale regulating the dividends again becomes operative; the new standard price being fixed at 17½d. per therm.

The Directors have paid dividends in respect of the half year ended June 30, 1921, at the rate of 5 p.ct. per annum on the preference stock, 6 p.ct. per annum on the "A" stock, and 4½ p.ct. per annum on the "B" stock; and they now recommend that the payment of these dividends be confirmed.

The accounts submitted show, after payment of the above-mentioned dividends in respect of the half year ended June 30, and providing for interest and all other standing charges, an available balance (including a sum of £13,174 brought forward from the last account) of £43,759.

The Directors recommend the payment of the full statutory dividends in respect of the half year ended Dec. 31—viz., at the rate of 5 p.ct. per annum on the preference stock, 7½ p.ct. per annum on the "A" stock, and 5½ p.ct. per annum on the "B" stock, all less income-tax. The undivided balance to be carried forward is £18,263.

There was a strange accident at the Preston Gas-Works last Thursday. George Walmsley, a stoker employed by the Company, lost his way in the darkness, and fell into a tank containing tar to a depth of 6 ft. His cries for help failed at first to attract attention; and for several minutes there was a struggle for life. A pedestrian, however, eventually heard his shouts, and, climbing the wall of the works, dragged him from the predicament.

SOUTH METROPOLITAN GAS COMPANY.

Quarterly Report of Official Testings of the Gas Supplied by the Company under the Provisions of the South Metropolitan Gas Act, 1920, and the Gas Regulation Act, 1920.

The following report, which has been forwarded by the Gas Referees, is reproduced as an example of the form in which these statements will appear.

The South Metropolitan Gas Company is required, until further notice, to supply gas which, when tested in accordance with the provisions of these Acts and the prescription of the Gas Referees, shall be, *inter alia*:

(1) Of an average calorific value of 550 B.Th.U. gross per cubic foot (at which value 1000 c.ft. are equivalent to 5½ therms).
(2) Of a calorific value not more than 6 p.ct. below 550 B.Th.U. gross on any day (a "complete 1 p.ct. by which the calorific value is deficient in excess of 5 p.ct.").
(3) Not containing any trace of sulphuretted hydrogen.

We, the undersigned Gas Referees appointed by the Board of Trade under the Gas Regulation Act, 1920, hereby certify that we have received the reports of the Official Gas Examiners appointed by the London County Council of all testings made by them according to our prescription in the quarter ended Dec. 31, 1921, at the six testing-places prescribed by us for testing the gas supplied by the South Metropolitan Gas Company, and have ascertained from them the following results:

That the average calorific value for the quarter is 554·6 B.Th.U. gross.

That on no day in the quarter was the calorific value at any testing-place deficient by 6 p ct. or more.

That no trace of sulphuretted hydrogen was found at any testing-place on any day during the quarter.

We therefore certify that the South Metropolitan Gas Company has fulfilled its statutory obligations in respect of the gas supplied by it throughout its district during the quarter ended Dec. 31, 1921.

C. V. BOYS,
W. J. A. BUTTERFIELD,
J. S. HALDANE,
} Gas Referees.

The Gas Referees prescribe that the results of the tests shall be made available to the public by the Gas Company exhibiting a copy of this report in each of its offices and showrooms, and providing each of its collectors with a copy for production to any consumer on demand.

MANCHESTER AND THE STRETFORD GAS-WORKS.

Report by Mr. William Newbigging.

In connection with the discussion that is now going on regarding the proposal of the Stretford Joint Board to promote a Bill for the purchase from the Manchester Corporation of the undertaking of the Stretford Gas Company recently acquired by them, the Manchester Gas Committee have received from Mr. William Newbigging, their Consulting Engineer, a report giving his estimate of the amount which will have to be spent on the Stretford Gas-Works if they are to serve the area of the local authorities whose Joint Board proposes to acquire them. Mr. Newbigging's report, it is stated, does not bear out the view expressed by the advocates of the Joint Board policy, that the works are at present in splendid condition, and require no substantial outlay beyond the purchase price.

In the first place, Mr. Newbigging points out that there is a deficiency in coal-gas carbonizing plant of 572,000 c.ft. on a maximum daily consumption of about 2,300,000 c.ft. This deficiency is made good by the manufacture of water gas, which is costly to produce, and should only be resorted to in cases of emergency. If the Manchester Corporation Gas-Works, he says, had not been partially and occasionally dependent during the past few years on water gas, the selling price of its gas would have been pence per 1000 c.ft. less than it is to-day. The problem the Joint Board will have to face in the near future, he goes on to say, apart from the age of the present plant, is as to how the coming demand for gas will be met. He points out that little land is available for the extension of the retort-house; but the provision of a house with a capacity of a million cubic feet and the remodelling of the existing house would cost £80,000.

Presumably, Mr. Newbigging says, the Joint Board do not wish to recognize this expenditure; and the alternative proposal is to extend the water-gas plant. But do the engineers to the Joint Board really believe in water gas, or is it a subterfuge, to tide over the consent of the ratepayers to the acquisition of the gas-works? He quotes opinions of both the technical advisers to the Joint Board—the late Mr. Isaac Carr and Captain Carr—against the use of water-gas plant, and points out that those opinions agree with the experience of Manchester.

With regard to the coal-gas purifiers, Mr. Newbigging says that in the very near future they will require renewing; and the cost will be in the neighbourhood of £20,000. As to the matter of distribution, the Joint Board in their Bill are asking for £15,000 for new mains. There are three items of expenditure to be incurred forthwith—namely, new housing estates, supply to the area taken over from Salford, and the extension of the existing 16 in. main to Croft's Bank, to supplement the supply to Urmston and Flixton. A conservative estimate of the cost of this work is £28,000; and the £15,000 proposed by the Board is totally inadequate to meet the expenditure required immediately.

The Proposed Wagon Association.—The Committee appointed regret that the support given to this movement has not been sufficient to justify the formation of an Association; and it has been decided not to proceed further with the matter. The subscriptions sent in by applicants for membership are now being returned in full to them.

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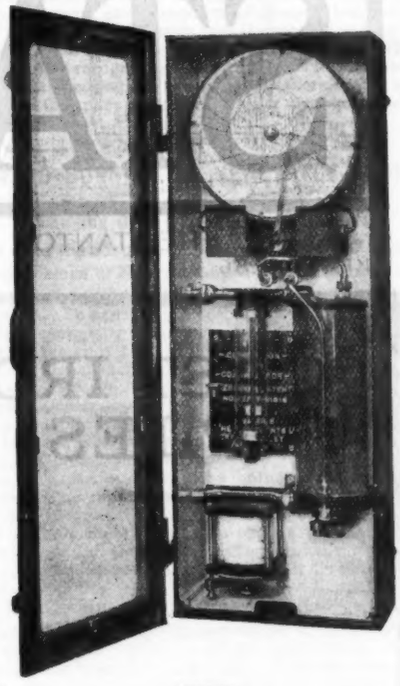
COAL SAVING IN GAS WORKS



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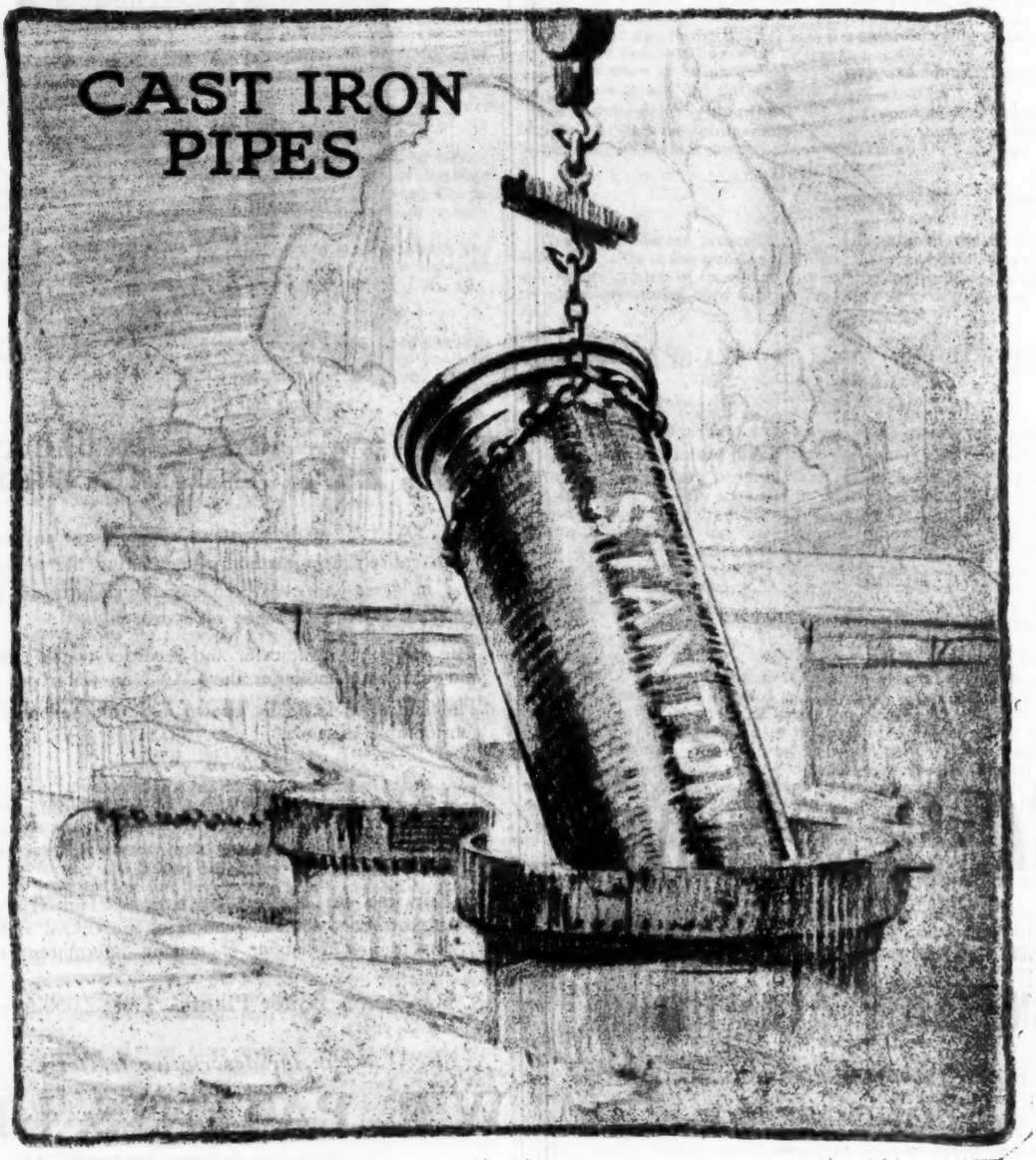

NOTTINGHAM AND THE THERM BASIS.

Considerable discussion having arisen in Nottingham as to whether an Order proposed to be applied for by the Corporation, under the Gas Regulation Act, empowering them to charge on the therm basis, would operate adversely to consumers, the Gas Committee were requested to prepare a report for presentation to the City Council.

In this report it is pointed out that the Act protects the consumer by the necessity on the part of the gas undertaking to declare the calorific value of the gas—a value which must be maintained within very narrow limits. As a safeguard for the maintenance of this value, a gas examiner will be appointed quite independent of the Corporation, as it is not within the power of the local authority to appoint a gas examiner where the local authority are the owners of the gas undertaking. The gas examiner will test the quality and pressure of the gas at frequent intervals, and, in addition, the Gas Referees will have power to enter upon, and inspect, any gas-works and call upon the undertaking to furnish any information which the Referees may reasonably require. Where the quality is certified by the examiner to be deficient in comparison with the declared value, penalties liable to be imposed.

As a good deal of misconception appears to have been occasioned in Nottingham regarding the purport and intended effect of the Act, the Committee have deemed it necessary also to take the trouble to make it clear that the price per therm will be declared by the Board of Trade at the time of making the Order; and for this purpose the Board will require the costs and charges of, and incidental to, the production and supply of gas by the undertaking over a period of years. Any increase in the standard price cannot be made without the authority of the Board. Moreover, the Committee emphasize the fact that the consumer will in all cases be charged by a system which, combining quality with quantity, makes comparison of prices with every gas undertaking in the country simple and definite. Many gas undertakings are now working on the therm basis; and there does not appear to have been any difficulty on the part of the consumer in appreciating thoroughly the new principles involved.

LIVERPOOL CITY COUNCIL AND WATER GAS.

A Report by the Medical Officer.

A report on the question of water gas by the Medical Officer of Health (Dr. Hope) was submitted at last week's meeting of the Liverpool City Council; but no action was taken in the matter.

Dr. MARNER, in view of recent gas poisoning tragedies in the city, addressed a series of questions to the Chairman of the Health Committee regarding the supply of gas.

Alderman MUIRHEAD replied that the Gas Company had power to lay mains in the streets in positions approved by the Corporation. In case of a leakage in a gas-main in the street, the Gas Company were responsible for its repair. If a Corporation employee observed any leakage from a gas-main, the Gas Company were immediately advised. The cost of repairs of this kind was borne by the Gas Company. The Health Committee officials exercised no supervision over gas-mains, but he (the speaker) could not say whether the Lighting Sub-Committee of the Tramways Committee exercised any oversight.

Dr. MARNER asked whether the Health Committee and the Medical Officer of Health were going to take any steps to see that water gas was no longer supplied in Liverpool in view of the recent fatalities, and in order to protect the lives of the public.

Alderman MUIRHEAD replied that he had a long report from the Medical Officer, which he could read if necessary. The Gas Company had been allowed by Parliament to do what they were now doing, and the Corporation could not interfere with them. It was a matter for the Imperial Legislature.

In response to repeated calls for the Medical Officer's report, the Lord Mayor decided that it should be read.

DR. HOPE'S REPORT.

The supply of water gas for trade and domestic purposes is now almost universal. The dangers associated with its use are well known, and depend in the main upon an excessively poisonous constituent—*i.e.*, carbon monoxide. On many occasions deaths have resulted from the use of water gas, but the trade advantages have hitherto outweighed the danger to health. The subject has from time to time received the careful attention of the Health Committee, and representations have been made to the Gas Company with a view to ensuring safety by the use of appropriate fittings, and also with a view to limiting the amount of carbon monoxide permissible in the gas.

The Board of Trade, with whom the matter rests, appear to be influenced largely by the wide use of water gas in America. A Departmental Committee have arrived at conclusions which ought, as a corollary, to be supplemented by the acceptance of certain obligations by the bodies supplying the water gas. The conclusions arrived at, briefly, were:

(*a*) That the Committee were justified in recommending non-limitation of carbon monoxide.
(*b*) That the danger of increased death-rate is small; and as against this must be set the improvement in the public health by the reduction of smoke and fog arising from the increased use of gas.
(*c*) The economic advantages greatly impressed the Committee; and they wished the development of the industry to proceed without any check.
(*d*) They suggest that the department concerned should carefully watch the situation, so that if the freedom from limitation which they recommend is accompanied by unexpectedly unfavourable results, the attention of Parliament may be called to the matter.
(*e*) They recommend that a pungent-smelling gas should be mixed with the water gas as a warning.

Dr. Hope is of opinion that unexpectedly unfavourable results have forced themselves upon public attention, and, indeed, it is surprising that a Departmental Committee should regard the repetition of what has many times occurred as unexpected.

There is, unhappily, no suggestion in the conclusions of the Departmental Committee as to the imposition of safeguards upon the trading companies supplying this extremely poisonous mixture for domestic purposes; the subject being regarded apparently wholly from the point of view of encouraging the manufacture and sale of water gas without regard to its effects upon health. It may be pointed out, however, that for industrial purposes there are limitations placed upon this poisonous admixture; and it is difficult to reconcile the view that precautions necessary in regard to industrial undertakings, when the workers would naturally be on their guard, are not equally necessary, if not more necessary, in domestic installations, when the attention is less alert. It is important to note that the electric supply department exercise supervision over the quality of the fittings and the character of the wiring, thus recognizing some obligation to safeguard from fire the property of the consumer. It would not therefore be unreasonable to ask the Gas Company to adopt a similar precaution where human life is concerned.

INVERTED BURNERS AT NEWCASTLE-UPON-TYNE.

Changing Over from the Upright System.

A report upon the adoption of inverted burners in place of upright for public gas-lamps at Newcastle-upon-Tyne has been submitted by Mr. Robert Davison (the Lighting Superintendent) to the City Lighting Committee. To assist in the description of the respective burners, photographs accompany the report, showing the component parts, and the general appearance when assembled in the street lanterns.

In 1920, the department found that it was necessary to replace 1000 burners, owing to depreciation during the war period; and this afforded an excellent opportunity of introducing a more up-to-date class of burner. The department set itself the task of carefully testing several kinds of burners, with the result that a report was submitted to the City Lighting Committee on July 23, 1920, recommending the adoption and fitting of superheated inverted burners in place of the existing upright ones. This report was confirmed by the Committee with, Mr. Davison says, complete justification, as the statistics and information embodied in the present report bear out. Owing to simple construction and adaptability, the cost of conversion has been very small; the work having been carried out by the attendants during the course of their ordinary duties, thus incurring no additional expenditure for labour. Mr. Davison, having described the fittings, proceeds:

Illumination.—Good and efficient street lighting is an important asset to any city or town; and the endeavours of the Lighting Department have been to obtain increased illumination combined with economy. The loss of efficiency due to the construction of the upright burner is very marked, while the simplicity of the inverted burner allows us to maintain a higher standard of illumination over a given period, the effect of which is quite obvious to the casual observer in the streets.

Mantle Consumption.—The renewal of mantles is an important and expensive item in street lighting, which is due to the vicissitudes of the climatic conditions to which they are continually exposed, and, in consequence, occupies the constant attention of the department. The upright mantle, having a very much larger surface, and being suspended from a clay rod by only a thin asbestos loop, is very sensitive, and easily destroyed by vibration, a condition to which street-lamps are frequently subjected, principally due to stormy weather and heavy traffic conditions. The "bijou" inverted mantle, which we have adopted, is much smaller and stronger in construction, and, being held more securely, is not affected to the same extent as the upright mantle. This has a great bearing on the question of illumination, as the vibration tends to break the upright mantle around the skirt, leaving it swinging and reducing its illuminating value considerably.

The saving effected in this direction will be noticed from the tabulated statement submitted, showing the comparative mantle averages per annum of upright and inverted mantles, together with their present-day costs:

Class of Burner.	No. of Burners.		Average No. of Mantles Used per Lamp per Annum.		Cost of Mantles per Gross.		Total Cost per Annum.	
	Upright.	Inverted.	Upright.	Inverted.	Upright.	Inverted.	Upright.	Inverted.
					s.	s.	£	£
No. 3 Kern	7001	..	18·1	..	66	..	2904	..
1 light inverted	..	2324	..	2·8	..	57	..	129
2 light inverted	..	4677	..	5·2	..	57	..	481
5 ft. S.I.	652	..	16·6	..	83	..	311	..
3 light inverted	..	950	..	9·9	..	57	..	186
10 ft. S.I.	786	..	13·2	..	116	..	418	..
5 light inverted	..	488	..	11·8	..	57	..	114
Totals Upright	8439	..	..	..	..	..	3633	..
,, Inverted	..	8439	..	..	..	..	..	910

Balance in favour of inverted lighting, £2723.

Gas Consumption.—With the inverted burner, the head or superheater can be made to carry any number of nozzles, thus enabling the department to increase or decrease the lighting by small units according to the requirements of the respective streets or roads. Each nozzle consumes approximately 2 c.ft. of gas per hour; and in applying this

advantage, the result has effected a considerable saving in the annual gas consumption. The following tabulated statement shows the comparative consumptions and cost of gas on upright and inverted burners:

Class of Burner.	No. of Burners.		Hourly Consumption in Cubic Feet.		Total Cost per Annum Gas 1s. 2d. per Therm (less 15 P.Ct.).	
	Upright.	Inverted	Upright	Inverted.	Upright.	Inverted.
					£	£
No. 3 Kern	7001	..	3½	..	19,205	..
1 light inverted	..	2324	..	2	..	3,462
2 light inverted	..	4677	..	4	..	13,561
5 ft. S.I.	652	..	5	..	2,286	..
3 light inverted	..	950	..	6	..	4,034
10 ft. S.I.	786	..	10	..	5,533	..
5 light inverted	..	488	..	10	..	3,383
Totals Upright	8439	..	..	..	£27,024	..
,, Inverted	..	8439	..	..	..	£24,440

Balance in favour of inverted lighting, £2584.

Summary of savings effected by the introduction of inverted lighting:

	£
Annual saving on mantles	2723
Annual saving on gas	2584
Total	£5307

The total capital cost of this conversion, which has been spread over two financial years, amounts to £2431; and this is recovered in less than six months. Taking this into consideration, along with the increased efficiency, the action of the Committee appears to have been quite justified in sanctioning this expenditure.

Further advantages have been gained, which have not been enlarged upon, owing to the want of data—such as the reduced cost of upkeep, as applied to spare burner parts, &c., the standardization of the mantle, and the abolition of inner glass globes, as used on the higher candle-power upright burners.

Wicklow Gas Boycott.—The boycott of gas by Wicklow consumers, which has now extended over three months, as a protest against the maintenance of high prices, has again been considered by the Urban Council, who condemned a break-away by some of those who had signed the boycott memorial.

Reduction in Price at Hastings.—In accordance with intimation previously made, the Hastings and St. Leonards Gas Company now announce that the price of gas, as from the Christmas readings of the meters, is 1s. 2d. per therm, which constitutes a reduction equal to no less than 10½d. per 1000 c.ft. The relative price on the prepayment system is 1s. 4·6d. per therm. With the declared value of the gas at 460 B.Th.U., 1s. 2d. per therm represents 5s. 4·4d per 1000 c.ft. Mr. Charles F. Botley (the Engineer and General Manager) points out that, in making this substantial reduction (which the immediate position does not warrant), further relief in the cost of labour and material has been anticipated. At present labour costs are slightly reduced. Coal is still 120 p.ct. more than pre-war, and oil 100 p.ct. more. There is also a very pronounced slump in all chemical products, which seriously affects the revenue from tar and ammoniacal liquor, and has other adverse influence.

Electricity Breakdown in the City.—Considerable inconvenience was caused in the Strand and City areas for some hours during the morning and afternoon last Thursday, through a breakdown at the generating station of the Charing Cross, West End, and City Electricity Supply Company, Marshgate Lane, E. Shops, offices, restaurants, theatres, and cinemas were affected. The offices of the Press Association and several newspapers suffered. At one building, electrically-controlled cranes were at work bringing in reels of paper; and these suddenly remained suspended in the air. The firm, however, had taken the precaution of deriving their electricity supply from two companies; and all their vital machinery was forthwith switched-on to the other source, and was soon at work again. Clerks at the Norwich Union Insurance offices had candles at the counters. Engineers at the generating station worked hard to remedy the defect; and the normal current was restored soon after 5 o'clock. At the Company's head office it was stated that the trouble was due to the fact that some new plant which should have been installed was not, through no fault of the Company, put in place.

Entertainment at the Cray Gas-Works.—The Cray Works of the South Suburban Gas Company have a good record for doing things well; and there was no slacking-off on the occasion of the annual entertainment held last Saturday at St. Mary Cray, when the Rifle and Social Club had the general employees, with their wives and children, as guests at the Cray Works. The proceedings commenced with tea, at which nearly 200 sat down. As indicating the interest displayed by the Directors of the Company in the social life of the employees, it may be mentioned that Mr. H. Gundry, Mr. J. H. Boraston, C.B., O.B.E., and Mr. W. Waller were present. Mr. J. Terrace (Chief Engineer), Mr. Wilfrid Wastell (Secretary), and Mr H. Baldry were also there. In the absence of the Chairman of the Company (Mr. Charles Hunt), who was unavoidably prevented from being at the gathering, Mr. Gundry presented the prizes won at bowls and billiards. The remaining part of the evening was spent in song and entertainment; and all the items were enthusiastically received. Mr. Stanley Hooker acted as accompanist. Mr. W. Gosling (the Station Engineer) impresses all with his geniality; and it is easy to see the source from which springs the perfect harmony that exists among all grades at the Cray Works. Similar gatherings have been held at the Sydenham, Bromley, and Dartford stations of the Company.

THE LIVERPOOL GAS-POISONING FATALITY.

The fourth victim of the gas-poisoning case at Liverpool (reported in last week's "JOURNAL"), Mrs. Craig, died on the 28th ult., at the Royal Infirmary. The operation of transfusion of blood was resorted to, in the hope of saving her life. Her death leaves a boy as the only survivor of the family.

At the inquest, in returning a verdict of "Death from carbon monoxide poisoning," the Coroner declared that, as long as the Gas Company were allowed to supply this kind of gas, householders should see to it that their gas fittings were in perfect condition, and that their windows were kept open while they slept.

An official of the Lighting Department of the Corporation gave it as his opinion that the reason why the boy Robert survived was that he and his brother slept in a room in which there was an open fireplace; while the others occupied a room in which the fireplace was closed. Witness stated that there had been a considerable escape of gas, sufficient to cause the death of the family, from the hall pendant, the rod of which had become oxydized, and was split down its full length. It was, he said, a cheap type of pendant.

Dr. *M'Fall*, Lecturer in Toxicology at the University, expressed his dissatisfaction with the quality of gas supplied at the present day. He complained of the difficulty of detecting an escape by smell, except when the gas was liberated in large quantities, and suggested that some foul-smelling gas should be added to the mixture. At the present time, the Liverpool Gas Company were acting quite legally in supplying this class of gas.

In reply to Mr. FRASER HARRISON, who represented the Liverpool Gas Company, witness said he could not agree with the opinion given by Dr. Haldane before a Departmental Committee last year that 20 p.ct. of carbon monoxide was a reasonable proportion, though he agreed that the percentage of about 15 in the Liverpool gas was reasonable.

Mr. *Ralph Ernest Gibson* (Engineer to the Liverpool Gas Company) said the percentage of carbon monoxide in this particular case was approximately 16, which was a safe amount. The Liverpool gas had a very pungent smell. The Company never sent out gas which was odourless; and they could not add anything more foul smelling to the gas than was already contained in it. He considered it advisable that, whenever householders smelt an escape of gas, they should have their fittings examined. The Company would examine fittings whenever complaints were made to them, whether the fittings belonged to them or not. He agreed as to the desirability of keeping windows open, but considered the turning-off of gas at the meter as unnecessary.

ORGANIZATION OF PRODUCTION.

In a paper which he read before the Manchester Association of Engineers, on Friday, the 27th ult., Mr. J. W. CURTIS, M.B.E., Assoc.M.Inst Mech E., of West's Gas Improvement Company, Ltd., dealt with the "Organization of Production." His remarks were illustrated by a number of charts, cards, &c.

Introducing his subject, he said that the cost of labour and materials is generally common to all manufacturers; and any credit balance in excess of competitors can only be secured by improved methods of manufacture or of organization. The aim of all management should be to obtain the best out of the business, so that, by keeping in close touch with each stage of manufacture and costing, and by removing or smoothing over any difficulties which arise or may probably occur, the production costs may be kept low. For continuity of effort, it is essential that a concern should possess exact knowledge of the amount of work to be done, the rate at which it is being done, and as to whether this is the best possible output considering the firm's capacity.

Not many years ago, in this country, many medium-sized works simply had a manager and foreman to carry on the business; and they were capable of keeping mental track of the work throughout its various processes. If this simple form of organization made efficient output possible, then the methods could have been justified, and anything more elaborate would have been rightly condemned. It is fairly safe to assume, however, that the high costs of production ruling at the present day, coupled with the shorter working hours—particularly machine tool hours—has compelled investigation which, in many cases, has revealed the fact that the greatest possible efficiency was not being obtained. Even in cases where this discovery has been accepted as correct by the management, it is surprising that in many instances both large and small concerns have been loth to probe the matter further, or to adopt remedies for obvious faults, on the pretext that the introduction of new measures would cause too great an upheaval of long-standing methods. Growing competition and financial losses, however, either immediate or impending, demanded some active measures on the part of the concerns affected.

It may safely be said that the more progressive business and industrial concerns now realize the value of production control, and expend considerable sums of money annually for the maintenance of this branch. The measure of the success attending on the policy adopted is revealed only by research. Research results in records; and for the records to be of any value, they must be carefully studied and analyzed. Any good method which procures and simplifies this analysis is worth carrying out. In this connection, graphic charts can be extensively used. The charts should be such that they provide the data which enable the management to know the state of the business at any time. They should also provide a means of seeing with a very fair degree of accuracy what is likely to happen in the near future. This, it must be admitted, is a very important feature of a firm's business, and one to which very often too little attention is given.

Until recently in this country there has been a lack of enthusiasm among engineering concerns for methods of organization, probably due, in the first place, to the fact that the average management asso-

ciated the idea of "organization" with a complicated and expensive system. In other cases, some measure of organization has been introduced, but has not received the whole-hearted support and encouragement necessary; and consequently the full benefits of such systems have not been derived.

Systematic and continuous investigation has been the secret of the progress of many firms in the past; and to-day the need for it is much greater. The great factor in successful organization of production is "keeping in touch." The general manager, while deputing detailed management to others, must be able to identify himself with that detailed management. He must decide on some means of "keeping in touch"—*i.e.*, some method by which he is able, at any moment, to know the details of the position of any contract, and to possess himself of up-to-date information on all points. By this means, he is able to keep his mind free for the larger issues, while at the same time he can pick out the detail as desired in the minimum of time. With the aid of the production department, he should be able to do this with comparative ease; for the function of this department is to be always in close contact with what is taking place in all other departments From the records kept by the production department, it is possible for the general manager to know the progress of the work as a whole, and the relation between all departments. If any items are being delayed, the causes of the delay can be investigated; and by reason of his broader authority, the general manager can deal with difficulties too great for his subordinates to handle.

To make deliveries to promise will frequently secure additional orders which would otherwise be lost. To facilitate the execution of work according to promise, all the work in a contract must be planned ahead, so that it is possible to foresee when it will be completed, and also to compare actual progress with the programme. When circumstances arise over which the firm have no control—such as trade disputes, making it impossible to keep to a promise—the progress charts and the schedules enable the firm to give the customer advance notice of the fact. In the case of orders which call for extensive erection work on the site on various contracts, arrangements can be made in advance to cope with the labour situation. The supervising engineer in charge of each contract can be informed by the production department of the state of future deliveries, &c., with enough notice for him to arrange beforehand for the amount of labour it will be necessary to engage on the site, two or three weeks ahead, throughout the progress of the contract.

The system of production organization outlined by him was not imaginary, but one which has been planned and developed to meet the requirements of a medium-sized works, whose business it is to supply and erect more or less complete installations of coal carbonization plant for gas undertakings. The main contracts, twenty of which may be in progress at any one time, cover a great variety of work, including foundations, buildings, brickwork, steel structural work, elevating and conveying machinery, driving gear, gas, tar, water, and electricity supply and fittings. In addition to the main business, there are generally many minor contracts for re-building existing installations on up-to-date lines, as well as a large number of detail orders for spare parts of all descriptions. Therefore, from the point of view of the production department, the works itself is only one source of supply. All the minor details—such as bricks of several shapes and qualities, slating, glazing, lifts, gas-engines, electric motors, and their equipment—are obtained from outside sources, whose rates of supply must be co-ordinated with the requirements of each contract, and of the business as a whole.

Price of Gas Strip.—The price for iron gas strip has been reduced by £1 to £12 10s. This was an adjustment which was demanded by recent price developments in relation to unmarked (finished) iron, which is now quoted at £11 10s. For a long time, however, steel, being so much cheaper, has been largely used for the making of tubes; and the mills have dropped another 5s, making the price £10 5s.

Gas Company's Compromise.—Recently the Stourport Gas Company, in accordance with the Gas Regulation Act, 1920, intimated to the Stourport Council their intention to alter the basis of charge for gas, and asked for a rate of 1s. 7½d. per therm. The Council, however, took the opportunity afforded of laying objections before the Board of Trade. A compromise has now been effected as the result of a conference between the Council and the Company; the latter agreeing to reduce the charge to 1s. 4d. per therm, provided the Council withdrew opposition. This course the Council confirmed at their meeting on Thursday last.

London County Council and Gas Quality.—Replying to a question by Mr. J. D. Gilbert, M.P., at last week's meeting of the London County Council, Sir George Piggott (the Chairman of the Public Control Committee) said he would ask his Committee to consider the question of the quality of gas supplied in London, and, if necessary, to submit a report thereon in due course. Where there was an admixture of water gas, there had resulted an increased proportion of carbon monoxide—a poisonous gas very dangerous to health when inhaled. So long as there was no escape of gas, there was no danger; but escapes, in consequence of the alteration in character of the gas, had now made it more dangerous. The presence in gas of a proportion of water gas dangerous to life was a point which would be dealt with in any report submitted to the Council.

Gas Company to be Asked to Justify Charge.—With regard to the price charged for gas at Oswestry, a Sub-Committee were recently appointed to consider the matter. The Town Clerk reported to a special meeting of the Council last week that this Sub-Committee had met, and now recommended that the Gas Company should be requested to furnish information showing justification for the amount charged for gas at the present time. Councillor Pasquill said he moved this resolution, and felt that, while they all recognized the admirable way in which the Gas Company had served the public of Oswestry for a long period, yet at the same time they had been continually raising their charges until they had gone up from 2s. 10d. to 6s. 8d. per 1000 c.ft.; and they were paying a dividend of 10 p.ct., free of tax. He thought it was time they protested against the high price of gas, and asked the Company to justify their charges.

TRADE NOTES.

Lighting Control (Automatic) of Staircases, &c.

An interesting experiment is being carried out in a large block of flats in the London area. A "London" clock controller, manufactured by the Gas Meter Company, Ltd., has been installed, fitted with a special attachment. The caretaker can light the whole staircase by pressing a button at any time considered necessary. Lights may be extinguished by the same method, or the clock may be set to extinguish automatically at any pre-arranged time. This method can also be adapted to shop lighting, where it is necessary to keep a light burning after closing time until a late hour—thus saving the gas used from that pre-arranged hour until opening time, or the necessity of leaving a man to extinguish the lights. The economy effected by the fixing of the "London" clock controller will be obvious and very appreciable.

Turbine Furnaces.

The Tunbridge Wells Gas Company have placed an order with the Turbine Furnace Company, Ltd., of 238B, Gray's Inn Road, W.C. 1, for one set of turbine patent furnaces, for their 6 ft. 6 in. dia. Lancashire boiler. The Gas Light and Coke Company have placed a repeat order for a turbine furnace for a Lancashire boiler at their Beckton works.

British Furnaces, Ltd.

A copy has been received from British Furnaces, Ltd., Millbank House, Wood Street, London, S.W., of a series of bulletins dealing with the subject of surface combustion furnaces for industrial purposes—a matter which, it will be remembered, formed the subject of a paper recently read by Dr. E. W. Smith before the Midland Junior Gas Association [see "JOURNAL" for Dec. 21 last, p. 816]. British Furnaces, Ltd., are an Association of the three firms of Woodall, Duckham, and Jones, Ltd., the Bryan Donkin Company, Ltd., and the Surface Combustion Company, Inc. To this combination, Messrs. Woodall, Duckham, and Jones bring their sound engineering experience and their high reputation and standing in the field of fuel treatment and utilization, as well as their acquaintance with industrial conditions in the British Empire. The Bryan Donkin Company bring into the new concern their reputation as makers of high-grade gas apparatus and their extensive manufacturing facilities, enabling British Furnaces, Ltd., to assure prompt delivery at favourable prices of all standard and special furnaces and fuel treatment equipment. The Surface Combustion Company furnish a complete and highly developed speciality in gas burning and furnace equipment, which is considered to be an advance, within the range of its application, over all existing types of similar equipment. Their system of firing and their apparatus have been developed and worked-out in detail in the course of many and various installations made in the United States over a period of more than five years; and the availability of their designs and full detailed information enables British Furnaces, Ltd., to execute promptly and successfully the most difficult installations of gas-furnaces. What they can do, in connection with furnaces for all kinds of industrial uses, is explained and largely illustrated in the bulletins before us, which are bound in convenient form in a stiff cover.

Gas Lighter for a Coke-Fire.

In last week's "JOURNAL," there was a letter from "Ad Rem," in which he asked: "As one of the difficulties in the use of coke in the home is its slow ignition properties, could not gas be adapted in any new design of grate both to kindle and revive the coke-fire, and thus still further popularize the use of coke and gas?" In response to this question, the Royill Manufacturing Company, of No. 48, Royal Hill, Greenwich, S.E., forward an illustration of a simple and cheap gas lighter, made entirely in metal, so that there is no wood handle to burn. This, they say, will ignite a coke-fire in a very short time, especially if the gas-nipple is opened a little. The device, which is in the form of a poker, and has been named the "Light-a-Fire," can be attached to the nearest gas connection with a piece of flexible tubing. Put coal or coke in the grate, light the gas at the holes in the poker, and push it into the fuel, and a good fire is obtained without further attention.

Cheaper Gas at Spenborough.—Having adopted the thermal unit method of charging for gas, and recently combined the Heckmondwike and Gomersal gas undertakings with their own, the Spenborough District Council last week reduced the price in the three areas by 2d. per therm. An amendment that the reduction should be 1d. only was defeated by one vote, though the last half-yearly account showed a loss on the three works of between £14,000 and £15,000. In this regard it was pointed out that, if there was a further loss of £1000, there would be no need to call on the ratepayers, as over £20,000 had been reserved from the profits of the Spenborough undertaking.

The ground, buildings, plant, mains, &c., of the Slamannan New Gas Company, Ltd., have been offered for sale as a going concern. The Company are in liquidation.

The Blackpool Finance Committee have sanctioned an application to the Ministry of Health for a loan of £10,000, in respect of gas mains and services for housing estates.

The Strichen Gas Company have gone into voluntary liquidation by decision of the shareholders, and a liquidator has been appointed. The Company have been in existence for 50 years.

The Rawmarsh (Derbyshire) Urban District Council have been informed by the Gas Manager that he considers it impossible to run the gas-works at a profit so long as coal remains at the present price.

The Port Talbot Town Council recently accepted the Gas Committee's recommendation that the price of coke be reduced to 35s. per ton. The Gas Manager was instructed to negotiate with Messrs. Baldwins Ltd. for a reduction in the price of bye-product gas.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 1.]

Nos. 1898 to 2667.

AIRD, K.—"Air-regulator for atmospheric gas-burners." No. 2101.
BAKER, C. G.—"Extractor or exhauster." No. 2378.
BENSON, M.—"Frictional distillation processes." No. 2273.
BENSON, M.—"Treating and distilling coal." No. 2431.
BENSON, M.—"Process of destructive distillation." No. 2432.
BLAKEBOROUGH, R. A.—"Control valves for gas-purifiers." No. 2348.
BRITISH THOMSON HOUSTON COMPANY, LTD.—"Pyrometers." No. 2515.
BROWN, J. F.—See Blakeborough, R. A. No. 2348.
CHAWNER, W. H.—"Inverted gas-mantle protector." No. 2209.
COOPER, W. R.—"Low-temperature furnaces for production of smokeless fuel and gases." No. 1969.
GENERAL ELECTRIC COMPANY.—See British Thomson-Houston Company. No. 2515.
GLOVER, W. T.—"Gas-meters." No. 2121.
HOGAN, J. P.—"Means for automatically closing gas-cocks, &c." No. 2493.
LEGG, G. A. T.—"Pipe couplings." No. 2048.
LORENZEN, C.—"Gas-turbine." No. 2404.
LUCAS, O. D.—See Marshall, F. D. No. 2539.
MARSHALL, F. D.—"Production of finely-divided carbon and hydrocarbon derivatives." No. 2539.
METERS, LTD.—See Glover, W. T. No. 2121.
NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.—"Distillation of tar, &c." No. 2534.
NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.—"Means for dehydrating liquids." No. 2550.
PARKER, J. H.—"Atmospheric gas-burners for firing furnaces." No. 2234.
PHILLIPSON, G A.—"Sulphate-of-ammonia drier and neutralizer." No. 2322.
PICKLES, H. J.—"Reversing-valves for regenerative gas-furnaces, &c." No. 1976.
RUTHERFORD, T. A.—See Pickles, H. J. No. 1976.
SOUTH METROPOLITAN GAS COMPANY.—"Manufacture of fuel." No. 2146.
SPRATT, G. A. & H. J.—"Means for lighting enclosed burners for lamps." No. 2244.
STEIN AND ATKINSON, LTD.—"Regenerative furnaces." No. 2236.
WALTON, H.—"Valves, &c., for gas-stoves, &c." No. 2118.
WELLINGTON, S. N.—See Cooper, W. R. No. 1969.
WIKNER, S. W. A.—See Newcastle and Gateshead Gas Company. Nos. 2534 and 2550.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 6.

The market for pitch continues very firm, and business is reported as having been done at 65s. per ton f.o.b. makers' works. There is a considerable amount of inquiry, and makers are now very fully committed. Creosote is a steady market at about 6½d. per gallon net and naked. Pure toluole is in short supply at about 3s. 6d. per gallon. Solvent naphtha, 95/160, is about 3s. per gallon. Pyridine bases is quoted at 6s. per gallon into buyers' drums. In other products, there is nothing fresh to report.

Tar Products in the Provinces.

Feb. 6

The average values for gas-works products during last week were: Gas-works coal tar, 33s. to 38s. Pitch, East Coast, 62s. 6d. to 65s. f.o.b.; and 57s. 6d. to 60s. f.a.s. West Coast—Manchester, 56s. 6d. to 58s. 6d.; Liverpool, 56s. 6d. to 58s 6d.; Clyde, 60s. to 62s. 6d. Benzole 90 p.ct. North, 2s. 2d. to 2s. 3d.; crude 65 p.ct. at 120° C., 1s. 8d. to 1s. 9d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 2d. to 2s. 3d. Toluole, naked, North, 2s. 8d. to 2s. 10d. nominal. Coal tar crude naphtha in bulk, North, 10d. to 11d. Solvent naphtha, naked, North, 2s. 2½d. to 2s. 5½d. Heavy naphtha, North, 2s. 1½d. to 2s. 5½d. Creosote, in bulk, North, liquid, 4½d. to 5½d.; salty, 3⅜d. to 4⅜d. Scotland, 4½d. to 4⅜d. Heavy oils, in bulk, North, 6½d. to 6⅜d. Carbolic acid, 60 p.ct., 1s. 10d. Naphthalene, £13 to £16; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

Manchester District Tar Prices.

The average prices realized for the sale of tar in the Manchester district for the months of November and December, according to sliding-scale, were as follows: November, £2 8s. 0·06d.; December, £2 7s. 8·86d.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

Although there is very little actual change in conditions, there has certainly been more inquiry of late for various coal-tar products. Pitch, however, is rather quieter, with prices well maintained at about 62s. to 65s. per ton. There is not much of interest in benzole; the prices being 2s. 11d. per gallon for pure and 2s. 7d. per gallon for 90's. Creosote is unchanged, with very little fresh business, at 5d. to 6d. per gallon. Cresylic acid is inactive at 2s. per gallon for pale 97-99 p.ct. quality, and 1s. 10d. per gallon for 95-97 p.ct. quality. Naphthalenes are very quiet; crudes being worth £5 to £8 and refined from £14 to £18 per ton. There has, however, been more inquiry for solvent naphtha; but business appears to be centred in the Midlands, and is not general. Prices, consequently, are not much altered from 2s. 4d. per gallon. Business in intermediate products has continued quiet; but these materials are becoming more interesting. Continental competitors are unable to give deliveries for some time ahead; and this is having a better effect on our market for export business. There is not much alteration in price.

Sulphate of Ammonia.

There is not much fresh in sulphate of ammonia. The demand for export is, however, rather more active, despite the fact that reports are current that buyers from this country have been in the American market for sulphate of ammonia in order to cover their sales abroad. Certainly, production of this material in the United Kingdom is not very large, and such a possibility is quite on the cards.

Growth of the Coventry Gas Undertaking.

Mr. P. N. Langford, the Engineer and Manager of the Coventry Corporation Gas-Works, gave some interesting particulars of the growth and development of the undertaking at a meeting of the Rotary Club. The concern was acquired by the Corporation in 1884, when the quantity of gas made was 185 million c.ft. per annum. In 1894 this had risen to 336 millions, in 1904 to 640 millions, in 1914 to 1124 millions, and in 1921 to 1777 millions. In 1884, the number of consumers was under 4000; and at the end of 1921 there were over 34,000. During the past nine months 1700 new consumers had been supplied. The use of gas for industrial purposes had also increased with enormous rapidity, and represented about 40 p.ct. of the output. During the last year the department carbonized 110,000 tons of coal; and 175,000 gallons of oil were used in the manufacture of carburetted water gas. In the same period 68,500 tons of coke were produced, 5700 tons of tar, 150,000 gallons of crude benzole, 160 tons of cyanide, and 1340 tons of sulphate of ammonia. The total turnover of the department for last year was £1,148,626. The purchase price paid by the Corporation in 1884 was £170,345, when the output was 185 million c.ft.; this being at the rate of 18s. 5d. per 1000 c.ft. The capital expended per 1000 c.ft. last year had been reduced to 5s. 9d. At the present time, the assets exceeded the liabilities by £244,000; and since the undertaking had been acquired, £97,515 had been paid over out of the profits to the general district fund for relief of the rates.

"Admittanitis."

"Admittanitis"—the disease of admitting—is an ailment from which the gas industry as a whole is suffering, according to Mr. H. H. Lackey, of Chicago, writing in the "American Gas Journal." When comparing the merits of gas as against electricity, he argues, we always start out with "I admit." We admit too much. Manufacturers of gas appliances are guilty of this weakness. The gas company officials and employees admit too much; and so do the gas industry publications. Everyone connected with the gas industry should be prejudiced and hopelessly one-sided in favour of gas for every purpose; and we should get over this admitting business. Mr. Lackey proceeds: "In a recent issue of a certain magazine, there appeared an article written by a good-intentioned gas man who had a bad case of 'Admittanitis.' He thinks that he has written a gas-boosting article, when actually he has written what amounts to a regular Thomas A. Edison of a booster for the fellows who sell the stuff that Ben Franklin swiped off the tail-end of a streak of lightning. This man began admitting with both hands, and when he had finished the poor old gas business didn't have any pants—haberdasherly speaking. He admits that electric ranges are bright and shiny, but that meals cooked on them are no better than those cooked with gas. Why didn't he say that, with an electric range in your kitchen, your bill for electricity would be slightly less than the rent? . . . When he admits that electric lights are fine, he overlooks the fact that they are fine when they are working and get the 'juice' to make them fine. And it has been my experience that electric current takes more vacations than a union pipe-fitter. The fact that the engineer at the power-house has a toothache is excuse enough to shut-down the whole plant, and leave a city in the dark for ten minutes at a time. A gas-light is more like the kind that God makes in the middle of the day than any light ever devised by man. I once bought a nice blue suit of clothes. It was a dark, rainy day; and I made my selection by the aid of a very superior, very expensive electric lamp. When I looked at my purchase at home under a 100 p.ct. perfect light—made by a $2.50 incandescent gas-lamp—I found that my blue suit was the colour of a Georgia water-melon. Our boosting (?) gas man admits that electric flat-irons are grand. They are grand—for the electric companies—but are more expensive than twins for the consumers." In short, Mr. Lackey's view is that while he does not advise anyone to go round "knocking" electricity, he would like to see everyone boost for gas. "For if we do not toot our own horn, it is going to go untooted."

The Dewsbury Town Council have achieved the remarkable feat—in these times—of saving £4054 in actual net expenditure as against their estimates, for the eight months' period ended Nov. 30 last. The Committees who underspent included the Gas Committee. They saved £1810 on their expected expenditure.

The Housing Committee of the London County Council have accepted an offer of the Gas Light and Coke Company to instal a gas-fire in one bedroom of each five or six roomed house at Becontree, on terms similar to those applying to three-roomed houses contained in the agreement with the Company for the supply of gas to the estate.

Announcement was made at the annual meeting of the Bradford Property Owners' and Ratepayers' Association that the Bradford Corporation Gas Department had agreed to take over gas-meters in houses belonging to members of the Association, if in reasonable condition, thus relieving landlords of their former responsibility for repairs and renewals. This is being done only on request by individual owners, and not in a wholesale manner.

Municipal Workers' Strike in Berlin.—Reports to hand go to show that the strike fever is rapidly spreading in Germany. In the course of last Saturday night, a strike of municipal workers became effective in Berlin; and it was declared that, until further notice, there would be no trams, no gas, no electricity, and no water.

South Metropolitan Annual Dance.—The fourth annual Cinderella Dance of the commercial and technical staff of the South Metropolitan Gas Company was held at the Dulwich Baths, East Dulwich Road, S.E., last Wednesday. Among those present were Mr. F. M'Leod (the General Manager), Mr. F. Day (Secretary), Mr. T. S. F. Gibson, and Mr. H. James. In Mr. A. Everitt, the Dance Committee have an enthusiastic Secretary; and he was untiring in his energy to make things go. The duties of M.C. were carried out in a thoroughly business-like manner by Mr. S. J. Miller (Vauxhall). It was a most enjoyable evening, and reflected great credit on all who were responsible.

An Unsolicited Testimonial.—The Volker Lighting Corporation, of Wandsworth, have been informed by Mr. Slingsby, of Clapham, that after a recent severe gas explosion at his house, the Volker gas-mantles in use at the time (although unprotected by globes) were found to be undamaged.

Subsidence of Gas-Mains at Abertillery.—The Abertillery Urban District Council have adopted the following minute in the Gas Committee's report: "Particulars of the damage done to the mains in Glandwr Street and on the Station Hill, Abertillery, were given; and it was resolved that the Ebbw Vale Steel, Iron, and Coal Company, Ltd., be written to thereon (as it appears that the damage was caused by subsidence), with a view to a claim for the repayment of the expenditure incurred—Station Hill, £51 19s. 4d.; estimated loss of gas, £28 15s.; total, £80 14s. 4d. Glandwr Street, £116 17s. 7d.; estimated loss of gas during year, 1921, £78 15s.; total, £195 12s. 7d.

STOCK MARKET REPORT.

THE Stock Exchange last week exhibited a degree of dulness (inherited from the week before) which continued, with only a momentary break, till the close. Home Government issues pretty well all round were hit. The big four were down, as witness Friday's figures—viz., Consols 51½-51¾, War Loan 93-93¼. Funding 78⅝ 79⅛, Victory 83⅜ 84⅛. Bonds were less weak, but Indians were much lower. Home Rails were brightened by dividend reports; but Argentines fell back.

Business in the Gas Market continued its activity, and more than maintained its firmness; the advances in price being more astonishing than ever. The three London Companies were very steady, with moderate rises in quotation. The big scores were in Suburban and Provincial undertakings—viz., Alliance and Dublin 2, Bournemouth debenture 6, Ilford debenture 5½, Lea Bridge 1, Portsea Island "B" 10, Sheffield "C" 2, South Suburban 3, Tottenham "A" 1¼, ditto "B" 8, ditto debenture 4, Tynemouth 2, and the Wandsworth stocks 2 apiece. In the remoter lands, Imperial Continental rose 2, Primitiva debenture 9, ditto of 1911 2½, and Buenos Aires and River Plate 2½ each.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin 48, 49, Bombay 3⅝, Bournemouth "B" 8¹⁵⁄₁₆, British 26, 26⅛, Gas Light ordinary 70¼, 70⅜, 70¾, 70⅞, 71, 71⅛, ditto maximum 54, 54⅛, ditto preference 67½, 68, 68⅛, ditto debenture 53⅜, 54, Imperial Continental 128, 128½, 129, Primitiva preference 41s., 41s. 9d., ditto debenture 75, ditto debenture (1911) 50, 50⅛, South Metropolitan 77⅜, 78, 78⅛, Southampton 58¾, Tottenham "B" 74½, 75, 75½, Liverpool 7 p.ct. preference 101⅛, ditto £30 paid 31-31⅜. On Tuesday, Bombay 3⅜, Brentford preference 70, British 26⅝, Commercial 4 p.ct. 62, European 8⅜, 8⁷⁄₁₆, Gas Light ordinary 70⅜, 70⅝, 71, 71⅛, 71¼, 71½, 71¾, 72, ditto preference 67⅛, 67⅜, ditto debenture 54, 54½, Imperial Continental 128, Primitiva debenture 74⅛, 75, South Metropolitan 77⅛, 77¾, 79, ditto 6½ p.ct. debenture 104¼, Tottenham "B" 75, Wandsworth debenture 53, Liverpool 7 p.ct. preference 101⅛, 101⅝, ditto £30 paid 31-31⅝. On Wednesday, Brentford preference 71⅜, British 26, Gas Light ordinary 71⅜, 72, 72¼, 72½, Imperial Continental 128, 128½, 129, 129½, Primitiva 13s. 6d., ditto preference 41s., South Metropolitan 77¾, 78⅜, 78½, 79, ditto 6¼ p.ct. debenture 104½, South Suburban 82, Liverpool 7 p.ct. preference 101½, ditto £30 paid 31-31⅜. On Thursday, Brentford "B" 83⅜, 84, British 26⅜, European 8⁷⁄₁₆, Gas Light ordinary 72¼, 72⅜, 72½, 72⅝, 73, 73⅛, ditto maximum 54, ditto preference 68, 69, ditto debenture 54, 54⅛, Imperial Continental 127½, 128, 128⅜, 129, South Metropolitan 78, 79, ditto 6¼ p.ct. debentures 103⅛, South Suburban 82, ditto debenture 75, Wimbledon 60, 60⅛, Liverpool 7 p.ct. preference 101⅛, ditto £30 paid 31⅛-31⅜. On Friday, Alliance and Dublin 54⅛, Brentford "A" 84⅛, Buenos Aires debenture 52, Cape Town District 6, Commercial 4 p.ct. 61⅜, 62, Croydon "A" 162, 163, Gas Light ordinary 72⅛, 72⅜, 73, 73⅛, ditto preference 68, 68½, 68⅝, 69, Imperial Continental 129, 129½, 130, 132, 132⁵⁄₁₆, 133, 133½, Primitiva 13s. 6d., River Plate debenture 53½, 54, South Metropolitan 78, 78¼, 78⅛, 79, ditto 6¼ p.ct. debenture 104-104⅜, South Suburban 81, 83⅛, ditto debenture 75, 78, Wandsworth "B" 62½, 63, Liverpool 7 p.ct. preference 101⅛, ditto £30 paid 31⅛-32.

In the Money Market, there was quite a fair demand at first: but supplies came in readily and met it. From this position, the ease so increased that at last money almost went begging at 1 p.ct. Silver was steady. The Bank rate is 5 p.ct., as fixed on Nov. 3.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 26	4	4½	Aldershot 4 p.c. Pref.	...	50—55	
1,551,868	,,	Oct. 13	2½	3⅛	Alliance & Dublin Ord.	39—64	52—55	48—54¼
574,000	,,	Jan. 12	4	4½	Do. 4 p.c. Deb.	76—70	46—51	..
280,000	5	Nov. 30	7½	4/-	Bombay, Ltd.	5¼—6¼	3¼—3⅜	3⅛—3¼
100,000	5	Aug. 11	16	4/7½	Bournemouth Gas and Water (5 p.c.	...	7⅛—8¼	..
383,110	10	,,	7	7/-	Bournemouth Gas and Water (B 7 p.c.	15—15½	8¼—9¼	8¹⁵⁄₁₆
115,000	10	,,	6	6/-	Bournemouth Gas and Water (Pref. 6 p.c.	13½—14	7¼—8¼	..
162,063	—	Dec. 30	—	4½	Bournemouth Gas and Water (4 p.c. Deb.	...	60—65	...
992,043	Stk.	July 15	14	36/-	Brentford A Consolid.	261—266	80—85	84¼
734,920	,,	,,	11	55/-	Do. B New	204—209	80—85	8⅜—84
55,000	,,	,,	5	5½	Do. 5 p.c. Pref.	109—111	68—72	70—71¼
221,400	,,	Dec. 15	4	4½	Do. 4 p.c. Deb.	91—93	60—62	
214,775	,,	Aug. 26	11	10½	Brighton & Hove Orig.	208—213	132—137	...
344,300	,,	,,	8	7½	Do. A Ord. Stk.	154—159	92—97	.
1,287,500	Stk.	July 28	5	5½	Bristol 5 p.c. max.	...	...	..
530,000	20	Sept. 29	12½	10½	British	44—45	25—27	26—26¼
120,000	Stk.	Dec. 30	4	4½	Do. 4 p.c. Deb. Stk.	88—90	59—64	
245,771	,,	,,	5	5½	Buenos Aires 4 p.c. Deb.	85—87	50—55	52
100,000	10	May 27	—	6½	Cape Town & Dis., Ltd.	1½—2½	6—7	6
100,000	10	Oct. 28	—	4½	Do. 4½ p.c. Pref.	4—6	4½—5½	.
100,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	56—60	...
137,150	,,	Feb. 26	5	5½	Chester 5 p.c. Ord.	108—110	...	
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	60—65	61½—62
560,000	,,	,,	5½	38/4	Do. 3½ p.c. do.	103—105	60—65	...
475,000	,,	,,	5	5½	Do. 3 p.c. Deb. Stk.	69½—71½	47—50	...
800,000	,,	Dec. 15	4	—	Continental Union Ltd.	76—79	18—20	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	33—38	
51,600	,,	Aug. 26	15	15½	Croydon A 10 p.c.	...	160—165	162—163
278,400	—	,,	12	12½	Croydon B and C 7 p.c.	...	125—130	...
492,470	Stk.	—	6	4½	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4½	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 26	10	5/0	European, Ltd.	17½—18	8—8¼*	8⅛—8⁷⁄₁₆
16,498,975	Stk.	Aug. 11	4/17/4	46/8	Gas Light and Coke (4 p.c. Ord.	92—102	72—74	70½—73¼
2,600,000	,,	,,	5¼	35/-	Gas Light and Coke (5¼ p.c. max.	76—79	52—55	54—54¼
4,062,235	,,	,,	4	4½	Gas Light and Coke (4 p.c. Con. Pref.	96—59	67—69	67½—69
4,674,850	,,	Dec. 15	5	5½	Gas Light and Coke (3 p.c. Con. Deb.	72½—74½	53—55	53⅛—54⅛
130,000	,,	Dec. 11	10	10½	Gas Light and Coke (10 p.c. Bonds.	...	...	...
82,500	,,	Sept. 14	5	5½	Hastings & St. L. 5 p.c.	...	...	...
258,740	,,	,,	5½	2½	Do. 5½ p.c.	87—89	45—55	...
70,000	10	May 12	11	5½	Hongkong & China, Ltd.	16½—16¾	5⅜—6⅛	...
86,600	Stk.	Aug. 26	9	9½	Hornsey 7 p.c.	...	100—105	...
131,000	,,	July 28	7½	7½	Ilford A and C	151—154	85—88	...
65,780	,,	,,	6½	5½	Do. B	115—118	65—68	...
65,500	,,	Dec. 30	4	4½	Do. 4 p.c. Deb.	92—94	60—65	...
1,976,000	,,	Oct. 28	9	5½	Imperial Continental	150—160	130—135	127½—133½
1,235,000	,,	Aug. 11	5½	5½	Do. 3½ p.c. Deb. Red.	84—86	64—69	...
255,848	,,	Aug. 26	6½	6½	Isea Bridge Ord. 5 p.c.	119—121	73—75	...
2,498,903	,,	Feb. 26	10	37/6	Liverpool 3 p.c. Ord. (A.	213—215	....	...
					Liverpool 3 p.c. Ord. (B.	146—148	...	...
306,083	,,	June 26	4	4½	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 11	7/5/0	6½	Maidstone 5 p.c.	...	54—56	..
63,480	,,	Dec. 30	—	3½	Do. 5 p.c. Deb.	...	40—45	...
75,000	5	June 11	6	5½	Malta & Mediterranean	4¼—4⅜	2—2½	..
250,000	100	Oct. 3	4½	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	93—100	...
541,920	Stk.	Nov. 30	4	4½	Monte Video, Ltd.	11½—12	53—58	...
1,875,892	,,	July 28	4½	5½	Newcastle & Gatsh'dCon.	98½—99½	67—69	...
529,705	,,	Dec. 30	3½	3½	Do. 3½ p.c. Deb.	82—83	50—52	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13	...
33,940	10	,,	7/14/0	5/3	,, ,, 7 p.c.	14—15	7½—8½	...
300,000	Stk.	Dec. 15	8	8½	Oriental, Ltd.	117—122	84—87	...
60,000	5	—	10	—	Ottoman, Ltd.	7½—7¾	2—3	...
188,120	Stk.	Dec. 30	—	6½	Plym'th & Stoneh'se 5 p.c.	...	69—71	...
60,000	50	Aug. 26	13	60/-	Portsea Island, B	128—131	74—77	..
100,000	50	,,	12	55/-	Do. C	118—121	51—54	..
249,980	5	—	8	—	Primitiva Ord.	5¼—6	⅛—¼	13/6
499,960	5	—	5	—	Do. 5 p.c. Pref.	4¼—5	1¼—2¼	41/—41/9
521,600	100	Dec. 1	4	4½	Do. 4 p.c. Deb.	91—93	74—76	74¼—75
600,000	Stk.	Jan. 26	4	4½	Do. ,, ,, 1911	...	50—55*	..
346,198	,,	Dec. 30	4	4½	River Plate 4 p.c. Deb.	85—87	50—53	53¼—54
150,000	10	Sept. 29	8	6/-	San Paulo (6 p.c. Pref.	10½—11	6—6½	...
125,000	50	Jan. 3	5	5½	San Paulo (5 p.c. Deb.	47—49	35—38	...
135,000	Stk.	Aug. 26	10	5½	Sheffield A	223—224	68—70	...
209,984	,,	,,	10	5½	Do. B	222—224	68—70	...
525,300	,,	,,	10	4½	Do. C	220—222	68—70	...
133,201	Stk.	Sept. 15	4	4½	Shrewsbury 5 p.c.	...	...	...
90,000	10	Oct. 28	9	8½	South African	10½—11½	7—9	...
9,609,895	Stk.	July 28	5/4/0	5½	South Met. Ord.	111—113	77½—79½	77½—79
250,000	,,	Jan. 12	—	5½	Do. Red. Pref.	...	94—96	...
1,895,445	,,	,,	3	3½	Do. 5 p.c. Deb.	72½—74½	51—54	...
224,820	,,	Dec. 15	8½	4½	South Shields Con. Stk.	157—159	86—88	...
1,087,795	,,	Aug. 11	6	5½	S'th Suburb'n Ord. 5 p.c.	114—116	80—85	81—83½
568,837	,,	Dec. 30	5	5½	Do. 5 p.c. Deb. Stk.	116—118	74—77	75—78
647,740	,,	Nov. 16	7½	4½	Southampton Ord.	99—102	57—60	58½
121,275	,,	Dec. 30	4	4½	Do. 4 p.c. Deb. Stk.	...	58—60	...
120,000	,,	Aug. 11	—	6½	Tottenham (A 5 p.c.	135—138	88—93	...
782,275	,,	,,	6	4½	Tottenham (B 5½ p.c.	115—117	75—80	74½—75½
181,255	,,	Dec. 15	4	4½	District (4 p.c. Deb.	87—89	62—67	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5½	Do. 5 p.c. Deb. Red.	93—95	45—50	...
256,476	Stk.	Aug. 26	5	5½	Tynemouth 5 p.c. max.	108½—109	67—69	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 11	3½	66/3	Wandsworth A 5 p.c.	151—156	81—83	
255,636	,,	,,	6½	51/3	Do. B 5½ p.c.	129—134	62—64	62½—63
108,075	,,	,,	—	46/4½	Do. C	...	59—61	...
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	...
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	58—61	60—60½
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	59—61	...
88,476		Dec. 30	1	3½	4 p.c. Deb. Stk.	66—69	30—33	33

* Ex Div.

Irish Gas Prices.—At a meeting of the Belfast Corporation, Mr. Workman (on behalf of the Gas Committee) said it was impossible to promise an immediate reduction in the price of gas. The matter was before the Committee; and they would take steps as soon as they could. The charge in Monaghan has been reduced by 5d. to 9s. 2d. per 1000 c.ft. In Dublin, during the hearing of a case, the Recorder suggested that the price of gas in the city—7s. 6d. per 1000 c.ft.—was too high. An Alliance Gas Company's official replied that expenses were very high; but his Lordship expressed the opinion that the price was too great a tax on the poorer classes.

Cannock Gas Company.—The twenty-fifth annual report of the Cannock, Hednesford, and District Gas Company shows that the receipts on revenue account for the past year amounted to £37,472; and this, with the sum brought forward from 1920, gives a total income of £38,131, as compared with £36,133 for the previous year. The expenditure was £36,897, as against £33,306 in 1920. A balance of £1234 was left, of which £1084 was absorbed by a dividend declared in June last at the rate of 5¼ p.ct. per annum. The Directors express their regret that, mainly in consequence of the increase in the price of coal and reduced rates obtained for residuals, the results of the year's trading do not admit of the payment of any further dividend.

Result of the Poll at Stretford.—The poll of the ratepayers has resulted in favour of the proposal to set-up a Joint Board in the area served by the Stretford Gas-Works, to acquire those works from the Manchester Corporation, who bought them from a private Company last year. The three districts in which a poll of the ratepayers had been demanded by the opponents of the scheme were Stretford, Sale, and Ashton-on-Mersey. In Stretford, 4119 supported the Joint Board proposal, in which their District Council had been the chief mover, and only 1525 voted in opposition. At Ashton-on-Mersey, the proposal had 877 supporters, and 606 opponents. Only in Sale was it defeated—by 1396 votes to 1180. The aggregate vote showed 6176 in favour of the Joint Board, and 3527 against.

Glasgow Gas Price Reduced.—A Special Sub-Committee of the Glasgow Corporation Gas Committee met last week, and are recommending to the parent Committee a reduction of 7d. per 1000 c.ft. in the price of gas to ordinary consumers, as from the dates of the readings of meters commencing during April next. The present charge, which is the statutory maximum, is 4s. 7d. per 1000 c.ft. When the price of gas in Glasgow was raised to 4s. 7d. per 1000 c.ft. at the same time last year, the rate to prepayment consumers was only increased by 2d. (from 4s. 5d. to 4s. 7d.), with the result that the price to them is now only being reduced by 2d. to 4s. 5d. per 1000 c.ft. There are reduced prices for large consumptions, down to 2s. 6d. per 1000 c.ft. for the biggest users for power and manufacturing purposes.

Street Lighting at Hull.—Revised charges for street lighting have been arranged between the Hull Corporation and the East Hull Gas Company, based on the price of 1s. per therm and on a reduction in gas-workers' wages which came into operation on Jan. 2. Any further reduction in the price of gas or wages is subject to a sliding-scale. The revised scale is: £6 7s. 1d. per lamp per annum for single-burner lamps; and £9 5s. 11d. for double-burner lamps, one burner being extinguished at midnight. The sliding-scale provides that for every 1d. per therm drop in the price of gas, the charge per lamp for single lamps is to be reduced by 6s. 3d., and similarly in the case of double-burner lamps a reduction of 9s. 9d. For every shilling per week drop in gas-workers' wages, the charge per lamp is to be reduced by 6d.

Places of Entertainment and Dual Systems of Lighting.—There is an old rule in London, and a very necessary one where electric lighting is concerned, that places of entertainment shall have a duplicate system of lighting. In 1905, the Theatres and Musical Halls Committee of the London County Council entered into a special arrangement with the Metropolitan Electric Supply Company, Ltd., under which the former recognized that the two electric supplies given by the Company were sufficiently independent to comply with the regulation requiring two supplies at places of entertainment. There must have been unpleasant happenings since, owing to the relaxation. The Committee report that the regulation is no longer operative; and the Council cannot therefore accept the supply of the Company for both the primary and the secondary systems of lighting at cinematograph halls or other premises licensed for entertainment. This evidently means that two distinct services will have to be provided. There have been several failures of supply lately. One was at Woolwich the other afternoon, when the supply was cut-off for from forty to forty-five minutes. All the dough-making plant of the Royal Arsenal Co-Operative Society stopped, lifts ceased running, and shops and other places were thrown into darkness. The papers mentioned these details as though they were unusual; but electricity users find them too common to be pleasant.

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